

NATURE STUDY

— FOR —

BOYS AND GIRLS

—  
CRAIG



FIFTH GRADE

—  
MCINDOO







NATURE STUDY TEXTBOOK  
FOR  
FIFTH GRADE





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Photographed in colors from mounted specimens. A. E. Shirling collection, Kansas City, Missouri

*CECROPIA MOTH* (top picture)

*CECROPIA MOTH*, underside (lower picture)

Cocoon on a twig. Cocoon cut open showing grub.





# NATURE STUDY

By JOHN BRADFORD CRAIG

NATURE STUDY

PITTSBURGH TEACHERS' TRAINING SCHOOL

PITTSBURGH, PENNSYLVANIA

## BOOK III

ILLUSTRATED

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The language of flowers  
In childhood's bright hours,  
Is a siren song of bliss;  
When the pure and the sweet,  
By the wayside meet,  
What prettier sight than this!

## PREFACE

The fifth year of school marks the pre-adolescent period. During this year the pupil shows a marked tendency to investigate in a more rational way than has marked his efforts of preceding years. He begins to classify, with some degree of consciousness, his experiences, and to interpret, in a large way, what he sees.

This tendency should not only be encouraged but should be utilized to its maximum in getting for him a more intensive meaning for himself and his relation to his environment.

Every form of life has its purpose and persistently seeks the end of its existence. The human individual must, in an intelligent manner, adapt himself to this eternal natural law. On the other hand he may, in turn, use and modify the "habits" of nature for his own benefit and advancement. This modification and adaptation has produced our modern cultivated fruits and has evolved a product much superior to the original type. It has, in the animal world, developed a

product better suited to the desires and needs of civilization. This development had its beginning with an intelligence of and a familiarity with nature and her laws. This mental attitude cannot be "born in a night." It must be the offspring of interested study. It naturally associates itself with childhood. Nor is the end or aim purely utilitarian. It reaches those qualities of the mind which lie at the foundation of natural appreciation, happiness, and reverence.

This third book of Nature Study has for its purpose the natural development of this reaction, which is already in the mind of the normal child of the fifth school year, and which is ready to express itself when the appropriate stimulus is presented.

J. B. C.

## LESSON I

## THE CHIPMUNK

native

stripes

enlarge

balance

protect

scamper

limb

impudent

period



CHIPMUNK

1. The chipmunk is one of the smallest and most beautiful of the little creatures that live in our woods. It belongs to the squirrel family. He is reddish-brown in color with darker brown stripes along his back. His tail is neither so long nor so bushy as the tail

of other squirrels. He is about the size of a half-grown rat.

2. Squirrels use their tails to balance themselves when they run along limbs of trees or jump from one limb to another. They run so rapidly and jump so far that they would very probably fall many times if they did not have something to keep them right side up.

3. Although the chipmunk sometimes climbs trees, yet he lives mostly on the ground. It is because he does not spend much of his time in the trees that he does not need a very bushy tail to balance him.

4. The color of the chipmunk protects him while he is on the ground. The reddish-brown and the stripes on his back make him look very much like the leaves and twigs over which he runs.

5. He uses his mouth and cheeks for a basket in which to carry things. When he wants to carry nuts, fruit, or earth, he stuffs them into his mouth until his cheeks are puffed out like balloons.

6. He is a very saucy fellow when you go near him. He will sit up on his hind

feet, with his tail curled over his back, and chatter in a very impudent manner.

7. The chipmunk is very careful and particular in building his home. His home is a burrow in the ground, like the home of the woodchuck. This burrow is made in dry earth near the root of a tree. His home always has a back door as well as a front door. The door is just large enough to allow him to get in. Inside of the door the chipmunk makes his home large enough to build his nest. He makes his nest out of leaves and dry grass. The back door is to allow him to get away if an enemy should come into his home by the front door.

8. During the fall he carries into his burrow a quantity of nuts and grain for his use during the cold winter. About the middle of November he goes into his burrow for the winter and does not come out again until spring. During the winter period he takes long sleeps, and each time he awakens, he eats some of the food he has stored away.

9. During the summer months he scampers through the woods and along fences, hunting for nuts and grain most of his time. He

will sometimes dig up the corn the farmer has planted in his fields if these fields happen to be near the woods. If there are no nuts on the ground and he can find no grain, he attempts to climb a tree for nuts. While he is climbing the tree he seems very much afraid of falling. He will go very slowly and avoid all dangerous places. When he gets a nut he will stuff it into his mouth and come to the ground to eat it. He eats his food much like some boys eat watermelon, holding it in both hands. You would think him almost human by the way he uses his hands or paws when he eats. After he has finished the nut he will scamper about for a time and then go up the tree for another nut. He will keep this up until he has finished his dinner.

10. The chipmunk will become very friendly if you treat him well and do not scare him.

### QUESTIONS

1. How large is the chipmunk?
2. Describe his color and appearance.
3. Of what use is the squirrel's tail?

4. How does the color of the chipmunk protect him?
5. Describe the home of the chipmunk.
6. Explain how the chipmunk lives during the winter.
7. What does the chipmunk do in the summer time?
8. What does the chipmunk eat and how does he eat it?
9. How does he carry his food?
10. Why does the chipmunk go slowly when he is in a tree?

## LESSON II

### THE CECROPIA

|          |             |         |
|----------|-------------|---------|
| cocoon   | caterpillar | pupa    |
| contact  | punished    | outline |
| wrinkled | hatch       | sticky  |
| pores    | appearance  | sheds   |

1. The cecropia is a large silk worm. It spends the winter in a warm silk cocoon which it weaves for itself. The cecropia hatches from an egg late in the summer. This baby is a real caterpillar and is less

than a half inch in length. Its color is almost black. It has three pairs of legs just back of its head and it breathes through little pores in its sides.

2. It molts or changes its clothes once each week for about a month. When it changes its clothes it never puts on the same colored



Photographed by A. E. Shirling in class room, Kansas City school  
CECROPIA CATERPILLARS FEEDING ON LEAVES

dress again. Its first dress is black, the next one is green, the next one orange, the next one yellow, and the last one is greenish-blue with black or blue spots.

3. Each skin or dress has horns on it which give it a very rough appearance. When the caterpillar sheds its skin for the last time, it has grown to be a very large worm. It is sometimes from three to four inches long and more than half an inch thick.

4. After it has put on its last greenish-blue dress, it eats a great many leaves during a period of about three weeks. It now begins to spin its cocoon. This cocoon is made with three walls so that it will be warm during the winter. The outside wall looks much like paper and is so made that it will keep out the water. The two inside walls are made out of fine silk which the caterpillar spins with the greatest care.

5. The silk comes from the caterpillar's lower lip and is a sticky fluid until it comes in contact with the air. The air dries it, and it at once becomes fine silk. With this the caterpillar spins its cocoon nest. When it has finished its bed, it molts and changes

into a pupa. It now stays in its warm bed until spring.

6. This pupa is brownish-black in color and is almost round in shape. It has very little ability to move. During this winter sleep, it is getting ready to change into a beautiful moth. If this pupa is examined carefully, the outline of the wings of the coming moth may be seen.

7. In April or May this pupa takes off its sleeping clothes and comes out of its winter bed a wet, wrinkled, sleepy looking moth. Very soon the air dries it and it is a large, beautiful moth, sometimes almost four inches across its wings. Each wing has near its center a white crescent fringed with red.

8. Although this large moth has a mouth, it never eats. It lives on what it ate while it was a caterpillar.

9. If you listen carefully while the moth is coming out of the cocoon you will hear a scratching sound. This sound is made by the two horns, which are just back of its head, scratching against the walls of the cocoon. These horns are used to put it out of its bed. If you watch the moth carefully you may see

the eggs which she lays. These eggs hatch and become caterpillars again.

10. Silk caterpillars, or silk worms, are used in China to make silk from which cloth is made. The silk worms in America make silk which is just as good as the silk made in China, but little use is made of the worms in this country. There are other silk worms in America, but the cecropia is the largest and developes into the most beautiful moth.

#### QUESTIONS

1. What is a cocoon?
2. Describe the cocoon.
3. How large is the cecropia when it is first hatched?
4. What are the colors of the dresses which the cecropia wears?
5. How does the caterpillar breathe?
6. How large is the caterpillar when it spins its cocoon?
7. What and when does it eat?
8. Where does the caterpillar get the silk which it uses for its cocoon?
9. When does the pupa come out of its bed in the spring, and what is it called after it comes out?
10. Describe its color and appearance after it comes out of its cocoon.

## LESSON III

## THE RED-WING BLACKBIRD

|                 |           |         |
|-----------------|-----------|---------|
| shoulder-straps | glossy    | uniform |
| sheltered       | generally | coarse  |
| continue        | anxious   | buff    |
| injure          | advantage | drill   |
| slender         | dignified | sway    |



RED-WING BLACKBIRD

1. When the red-wings gather in the fall for their journey southward, they look like a great army of soldiers coming together for battle. Each male wears bright red shoulder-straps on his uniform. When he is on the ground he goes about with a stiff, dignified walk, like an army officer drilling his men.

He is very proud of his uniform and tries to show it to the best advantage.

2. Sometimes this army of birds will cause an entire grove of trees to look black, there are so many of them in the branches. Many will be swaying from the tips of very slender limbs, and all seem to be calling to each other "konk-ker-ee-ee, konk-ker-ee-ee."

3. When they have completed their large army, they fly to the southern part of the United States where they spend the winter. Here they live in the swamps and rice fields until March or April when they return to their northern homes.

4. Mr. Red-wing always goes north about two weeks before his wife. When she arrives they are both very happy and at once begin to look for a good place to build their nest. They like to find a sheltered place in the low bushes or tall grass. Sometimes they build their nest on the ground in a pasture field, but they like low bushes near a swamp better. Mrs. Red-wing generally builds most of the nest. She builds the outside with coarse grass and uses fine grass for the inside. She is anxious to have the inside very soft

for the baby birds that are soon to come. If it is possible, she will hang the nest by its rim to the branches of the bush in which she builds it.

5. When the nest is completed she lays from three to five eggs in it. These eggs are bluish-white in color with dark markings on the larger end.

6. When the baby blackbirds are hatched, their parents feed them worms, bugs, caterpillars, weevils, and many other kinds of insects. These baby blackbirds look more like their mother than their father, until they are about one year old. When they are about one year old the young birds that are males put on their glossy-black uniforms with red shoulderstraps. The young females continue to wear their brownish-black coat speckled with tiny brown and buff spots. This is the kind of coat the mother blackbird wears all of the time.

7. The mother bird, with the brownish-black coat, looks as much like the cowbird as she looks like her husband. It is easy to know that she is a real blackbird because she is generally found with her uniformed husband.

8. Blackbirds are of much benefit to the farmer. They destroy very many bugs and insects that injure the crops and the fruit in the orchard. Blackbirds are so helpful that, in some places, laws are made to punish those who kill the birds. In many of the states, and provinces of Canada, there are laws to protect all song birds. If these birds were not protected, it would not be very long until farmers and gardeners could not raise crops for food because of the insects.

#### QUESTIONS

1. Why do blackbirds gather together in the fall?
  2. Describe the appearance of the blackbird.
  3. What kind of a song does it sing?
  4. Where do blackbirds build their nest?
  5. Where do they spend the winter?
  6. How is their nest built?
  7. How many eggs are laid in the nest?
- What is their color?
8. Of what use is the blackbird?
  9. How is it protected?
  10. When do blackbirds return to their northern home?

## LESSON IV

## THE RACCOON

|         |          |           |
|---------|----------|-----------|
| injure  | rail     | frightful |
| rooster | dreadful | squawk    |
| drag    | curl     | crawl     |

1. Coon is the shortened name for raccoon. It inhabits the United States, Mexico, and parts of southern Canada. On account of its amusing ways it is often kept as a pet.

2. Once upon a time a raccoon lived in a hollow tree in the woods. This woods was near a creek. He had lived here for a long time and liked his home. Dogs and other enemies could not climb the tree to injure him, so he felt safe.

3. In the daytime he would crawl out of his den and curl himself up in the fork of the great tree in which he lived, and go to sleep. The color of his fur was almost the same as that of the tree, so that he would not easily be noticed in the tree.

4. One dark rainy night he started out to get a hen from the farmer's poultry house. He knew the farmer had a little dog named

Spot, but he was hungry and he thought Spot might not hear him. He ran down along the creek until he came to a place opposite the



RACCOON AT HOME  
(He photographed himself)

farmer's house. Here he left the creek and ran along close beside an old rail fence which led directly to the poultry house.

5. He was afraid Spot would bark, and the farmer would come out to see why he was barking. He was also afraid the farmer might bring his gun with him. He knew Spot always barked when strangers came about. Before Mr. Coon entered the poultry house he stopped to listen for any sound he might hear. He could hear nothing and was about to enter when there was a frightful noise inside of the poultry house. Mr. Coon was badly scared and ran back to the rail fence behind the poultry house. Then he heard it again. This time he knew what it was. It was just the rooster crowing. He would have known what it was when he heard it first, but he was so close to it that it scared him.

6. Mr. Coon now returned to the door of the poultry house and listened again. He decided he could easily get a fat hen and get away before Spot could find where he was. He crept in quietly and walked up a board to where the chickens were roosting.

When he knew he was close enough he jumped very quickly and caught a big hen in his claws. She made a dreadful squawk, but Mr. Coon had taken hens before and knew what to do, so he held her firmly in his mouth and ran as fast as he could. He knew he would need to get away very quickly. He did not stop running until he reached the creek. Spot heard the noise and began to bark, but when he reached the poultry house Mr. Coon was walking in the middle of the shallow creek. He was partly carrying and partly dragging his load because it was getting very heavy for him to carry. He walked in the water so that Spot could not follow his trail. When all was quiet again, and Spot had gone back to his bed on the porch, Mr. Coon began to make his breakfast on his fat hen. He would tear a piece of meat off with his claws or his teeth and then wash it in the water before he would eat it. When he had eaten all he wanted, and had taken some to the little baby coons in the hollow tree, he went to the creek and splashed his feet around in the water until they were clean. Coons always wash their meat before they

eat it, and then wash their hands afterward, if they can get water with which to wash. After he had cleaned his hands, he went back to the hollow tree.

7. While Mr. Coon was away getting a hen at the poultry house, Mrs. Coon was across the creek in the cornfield getting some soft corn. She had not yet returned so Mr. Coon called to her from their home in the hollow tree. This call sounded almost like the cry of a little child, but Mrs. Coon knew his voice and soon came home. Mrs. Coon would get the corn by pulling down a stalk of corn until she could reach the ears that were beginning to ripen. Sometimes this would break the stalk and cause the farmer to get very angry because he did not want his corn destroyed.

8. This was in August and the baby coons were about three months old. Mr. and Mrs. Coon took good care of these little baby coons and not only brought them chickens and soft corn but caught fish in the creek for them. Sometimes they brought frogs from the swamp near by. Sometimes it would be young birds, and sometimes snakes.

9. When the weather began to get cold, and the little coons were large and fat, they all crawled into their home and went to sleep. Here they stayed until the next March.

## QUESTIONS

1. Where do coons live?
2. Name one of their worst enemies.
3. Name four things that coons eat.
4. When do they hunt their food?
5. How do coons carry their prey?
6. How do they prepare their meat to eat?
7. What do they always do after eating?
8. What kind of sound do coons make?
9. Where do coons stay during the winter?
10. When do they come out of their winter home?
11. What is the size and color of the coon?
12. What animal does he most resemble?

## LESSON V

## THE DOGWOOD

|         |          |           |
|---------|----------|-----------|
| Europe  | France   | pickled   |
| skewers | received | disease   |
| butcher | mange    | continues |

1. The dogwood makes a very great effort to show itself. Its beautiful white flowers seem to cover the entire tree when it is in bloom. At this season of the year the dogwood is easily noticed because there are no trees in the woods which have showy flowers.

2. When the bees and other insects see this beautiful tree they fly to it to get the nectar from its flowers.

3. The bark of the dogwood tree is very different from the bark of other trees. It looks just like the back of a real alligator. Every kind of tree has a bark that is different from other trees. This is one way people know the different trees even when the trees have neither flowers nor leaves.

4. The banner flowers of the dogwood look as though they had been in a great war because each petal has a scar on it. These scars



*Dogwood*



were not caused by a war, but by very hard work which they did during the cold weather.

5. Examine the center of a flower and you will see a little green soldier and four



#### FLOWERING DOGWOOD

- |                                |                     |
|--------------------------------|---------------------|
| 1. Winter twig with leaf buds. | 4. Leaf             |
| 2. Winter twig with flower bud | 5. Flower, enlarged |
| 3. Flowering branchlet         | 6. Fruit            |

yellow soldiers standing around him (see No. 5 in drawing, page 29). This little green soldier receives the yellow pollen which the bees bring. The little yellow soldiers give pollen to the bees that they may carry it to the next flower which they visit.

6. After the bees have carried the pollen from one flower to another and have worked very hard at this for many days, the seeds down at the lower end of the flower begin to grow. Soon these seeds grow into berries. The people in Europe call these berries cherries. They look something like cherries, being almost as red as our cherries.

7. The birds like these berries and carry them very far from where they grow if their nests are not near where the dogwood grows. Here the seeds are at last dropped on the ground and later grow into trees.

8. The tree turns the color of its berries red and they are then ready to be carried away and the seeds ready to be planted. The birds will then be certain to see them. In order that the birds may not eat the seeds, as well as the fleshy part of the berry, the tree makes the outside of the seed very hard.

Inside of this hard shell is the embryo, which is the part which grows when the seed is planted. So the birds eat the soft part of the berry and drop this hard part on the ground where it later grows into another dogwood.

9. The wood of the dogwood is very hard. It is used for making many things which require very hard wood. Skewers are made out of the dogwood. These are little wooden pins which the butcher uses to pin meat together for roasting. The wood of this tree is also used by farmers for making runners for their farm sleds. They are able to use these runners for years without wearing them out. This is because the wood is so hard.

10. The dogwood begins to bloom in May and continues in bloom for two or three weeks. Farmers generally plant their corn at about the time the dogwood is in bloom. Dogwood berries are sometimes used for food, being eaten raw, and sometimes gathered when the fruit is green and pickled like olives. In France these berries are used to make a kind of oil that is used in lamps.

11. How did the dogwood get its name? Some people think it was named because its wood was and is used to make skewers. Other people believe it received its name because the leaves and branches are used to make a



WESTERN DOGWOOD BLOSSOMS

kind of wash for curing mange. Mange is a skin disease common to dogs.

12. There are many different kinds of dogwood trees. Some kinds, or species, have small flowers in clusters much like alder blossoms. These have dark blue or creamy-white berries. The berries are very bitter but the birds are very fond of them.

#### QUESTIONS

1. Describe the different flowers of the dogwood.

2. Explain why the berries turn red or blue when they are ripe.

3. What are dogwood berries sometimes called?

4. At what time of the year does the dogwood bloom?

5. Explain how the bees and birds help the dogwood.

6. What kind of bark does the dogwood have?

7. For what is the wood of the dogwood used? Why?

8. What are skewers?

9. If you were to try to find a dogwood tree what would help you find it?

10. How did the dogwood tree get its name?

## LESSON VI

## THE KATYDID

|             |         |           |
|-------------|---------|-----------|
| grasshopper | pores   | delicate  |
| quiet       | breath  | monkey    |
| generally   | abdomen | necessary |



KATYDID

1. The katydid looks very much like the grasshopper. Her legs and wings are much the same but her color is green. She seems very much afraid of being seen because she keeps very quiet during the daytime. When it begins to get dark her husband, Mr. Katydid, begins to sing and sometimes sings all night. Although the katydid hops around through the bushes as he sings, he is very hard to find because his color is the same as the leaves among which he seems to hide.

2. Only the male katydid sings. On any summer evening you can hear him sing his "Katydid, Katydidn't" as though he were trying to attract attention from the song of the screech owl and the frog which are generally singing at the same time.

3. The katydid makes the sound for his song by rubbing his wings on a little file which he carries just beneath where his wings overlap. The locust and some other insects make their song in the same way.

4. Examine his wings and you will find he has a very beautiful covering for them. This covering has veins in it just like a leaf. The under wings, or true wings, are very delicate and beautiful; they look like the veils which people sometimes wear.

5. When you hear him sing in the evening, if you follow the sound, you may be able to locate him if you have a light. When you are looking for him you must go about it with great care because he does not want to be seen. So well can he hide that during the daytime you may be very close to him and not see him at all.

6. The katydid does not breathe like people or animals do. He breathes through his

sides. On the sides of his abdomen you can see some very small dark spots. These are breathing pores and if you will watch him when he breathes, you will see these dark spots open and close. These pores open and close like the gills of a fish as it swims through the water.

7. If you are able to catch a female you will find at the end of her body a long hook. With this hook she places her eggs on the twigs and grass stems.

8. The katydid eats just like a monkey. He will take a leaf, which looks to him good to eat, in his hands or claws and bite off a small piece. When he has chewed this first piece well he will bite off another and keep doing this until he has had his entire meal.

9. The katydid folks are very cleanly. They wash and clean up several times each day. Their feet are always washed first. There are two little pads on each foot. These pads get dirty as they hop around through the bushes, and must be cleaned. When they clean these pads they bite off the dirt because they can't get it off any other way. When they have their feet well cleaned, they

wash their face with their hands. It is just as necessary for the katydids to keep clean as it is for people if they are to keep well.

10. If a katydid were to become ill he would probably die, because katydids have no doctors as people have. But katydids do not often become ill because they take good care of themselves.

#### QUESTIONS

1. What other insect looks much like the katydid?
2. When does the katydid sing?
3. How does the katydid make the sound for his song? "
4. How are the wings of the katydid covered?
5. How may you catch a katydid?
6. How does the katydid breathe?
7. How and what does the katydid eat?
8. Explain how the katydid cleans himself.
9. Why does the katydid clean himself?

## LESSON VII

## THE MAY APPLE

moisture

bee-bread

pollen

umbrella

bumblebee

pistil

invitation

alight

permitted



MAY APPLES

1. The May apple does not look much like an apple. It looks more like a large yellow plum. It grows on a small stock about one foot high. This stock does not often have more than two apples or two leaves. It grows

best along the edge of the woods where it can get the shade during a part of the day. It needs plenty of moisture and grows best on low damp ground.

2. The May apple dies down to the ground every fall. Since its roots keep alive during the winter, it grows again every spring.

3. The leaf of the May apple looks much like an umbrella and is used for almost the same purpose. A part of the work of the leaf is to protect the apple, which grows under it, from the sun.

4. When this plant first appears above the ground in the spring, after the cold of winter has gone, the apple bud grows rapidly. This apple bud seems scarcely able to wait until the leaf bud has grown enough to raise its umbrella. It pushes past the leaf bud as much as to say, "I can take care of myself and I don't need to wait for your umbrella."

5. When the sun gets warm and the flower bud opens, the May apple is then in need of the umbrella. It must have the umbrella to protect its beautiful white banner flowers from the hot sun.

6. These white banner flowers attract many insects to the May apple, but the flowers have no nectar to give them when they come. There are not very many flowers that do not have nectar for the bees to repay them for carrying the pollen for them. All Nature is honest and plays fair, so we must find something which the bees get when they come to visit on the invitation of the white banner flowers.

7. Let us watch the bees when they come to the May apple and we shall see what they get. Soon you will see a large queen bumblebee come to the flower. She will alight on the petals and look around to make certain she has a good place to stand. When she seems to have a good place she will at once begin to gather the pollen. What can she want with this pollen? Watch her carefully and you will see.

8. When she has all of the pollen she can easily carry, off she flies. If you follow her, you will find she will carry the pollen to a nest she is building on the ground in the clover field. She probably has found an old nest of a mouse and is rebuilding it for her family. Here she uses this pollen to make bee-bread which the baby bumblebees will eat.

9. Before the queen bumblebee gets all she can carry of the pollen, she may visit many blossoms and, in doing this, she will rub a part of the pollen which she has gathered, on the pistil of the next flower. This starts the growing of the seed and is what the flower gets for furnishing pollen to the bee for her bee-bread.

10. Moths also visit the blossoms of the May apple at night. They can easily locate flowers at night by their white banners or by their fragrance.

11. When the petals of the May apple begin to drop off, the apple grows very rapidly. In July this apple changes from a green color to bright yellow. This yellow color shows that it is ripe and ready to eat. If hogs are permitted to pasture in the woods they will eat these May apples. They seem to like them as well as acorns which they find under the oak trees.

12. Very soon after the May apple ripens the leaves will wither and die. The May apple will either be eaten by some animal or bird, and its seed carried far away from the home plant, or it will fall down to the ground

and come up as a new plant the following spring.

13. If you were to go through the woods late in the fall you could not see any May apple plants or anything that looks like them. They have all died down to the surface of the ground. Their roots are not dead but are getting ready to come up again when the warm sunshine of spring comes.

#### QUESTIONS

1. Describe the appearance of the May apple.

2. Where does it grow?

3. Why does it grow only in certain places?

4. How many leaves and apples are on each plant?

5. Of what use are the leaves?

6. Are May apples good for food?

7. What kind of flower does the May apple have?

8. Does it have nectar for the bees? Why do bees come to visit it?

9. How are the seeds of the May apple scattered?

10. When does the May apple bloom and when is the apple ripe?

## LESSON VIII

## THE CRAYFISH

|         |           |             |
|---------|-----------|-------------|
| joints  | glue      | information |
| canoe   | difficult | pincers     |
| channel | peculiar  | condition   |

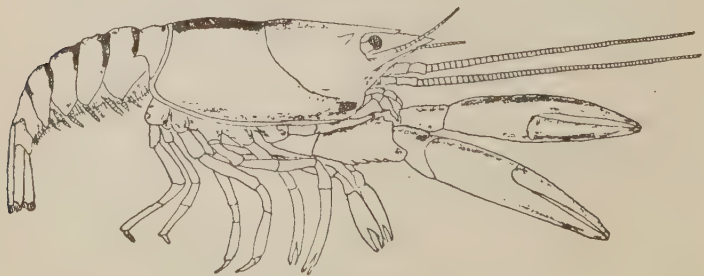
1. The crayfish is often called a crab and may be found in all shallow streams in summer. When the weather begins to get cold in the fall he burrows down deep in the mud to keep warm and stays there until spring.

2. The most peculiar thing about the crayfish is the kind of hands, or claws, he has and the way he is able to use them. He can use them as pincers. With these pincers he gets his food and fights his enemies. These pincers are located near the front end of his body. They seem to take the place of his front legs. These pincers, or front legs, have five joints and have saw teeth on what seems to be the inside of his toes. These toes are strong and he can pinch very hard with them. If you will allow him to pinch your finger you will know how strong they are.

3. The next pair of legs have pincers much like the first pair only they are not nearly so

large nor so strong. The crayfish is well able to care for himself against almost any enemy that may attack him. If he cannot kill his enemy or drive him away with these pincers he, himself, may get away by swimming. The crayfish is a good swimmer. He generally swims backward when he is in a hurry because he can use his tail better when he is going backward.

4. The tail of the crayfish is curled up under him most of the time. When he swims he uses it very much like a boy in a canoe would use a paddle. He also has five pairs of fan-like swimmers under his tail. The female crayfish has only four pairs. In the spring the female lays her eggs and glues them to these four pairs of fan-like swimmers. Here they hatch and cling until the baby crayfish are able to care for themselves.



CRAYFISH

5. The crayfish seems to have plenty of legs and claws. If you look between his two front legs, or pincers, you will find two more pairs of legs or feet. He uses these to help him move about, but mostly to feed his three pairs of jaws.

6. The crayfish gets his information by sight, and by feeling with his long hairs, or feelers, which seem to grow out of his face and which he moves about all of the time. He can see very well in the water. His eyes are set almost on the top of his head.

7. Examine the crayfish carefully where the second pair of legs are joined to the body. Here you will find his breathing gills. These gills are also found where the third and fourth pairs of legs join the body. He uses these gills for lungs.

8. The crayfish spends most of his time in the mud or among the rocks at the bottom of the stream. Here his color makes it very difficult for his enemies to see him, while he can see what goes on above him.

9. His food is worms, insects, and fish, that have died and sunk to the bottom of the

stream. By eating these, the crayfish keeps the stream clean.

10. The crayfish, like snakes, sheds his skin, or shell, several times. Just after he has shed his old skin he is not in very good condition to defend himself. His new skin is not so hard as his old one, and, until it grows hard, he is more easily hurt. Sometimes in his fights with his enemies he may lose a leg. If he does, a new one will soon grow in the place of the old one.

11. Crayfish sometimes, by digging holes in the bottom and sides of streams, may lead the stream out of its channel or change the course of water to a spring, but the little damage they do is more than repaid by their keeping the streams clean.

#### QUESTIONS

1. Where does the crayfish live?
2. How does it defend itself?
3. Describe its two large front legs.
4. How does it get its information of what is going on about it?
5. How does it breathe? What does it eat?
6. Where may you find crayfish?

7. Can it live under water? Can it swim?  
How does it swim?

8. Why does it generally stay at the bottom of the stream?

9. How does the female care for her baby crayfish and where does she keep them?

10. Of what use is the crayfish?

## LESSON IX

### THE MUSHROOM

|        |        |           |
|--------|--------|-----------|
| ghost  | liquid | buzzard   |
| decay  | plants | grain     |
| spores | poison | toadstool |

1. If plants could think they certainly would consider the mushroom a ghost. It is white like a ghost, does not have any flowers that you can see, and does not seem to have any life.

2. There are not many plants that remain white all of the time. The mushroom and the toadstool are the most common. Plants that are white and not green, always steal their food from another plant. These robber plants may get their food in one of two ways. They may get it by growing on the trunk of another

tree or plant that is living, or they may get it by growing on the decayed parts of other plants.



MUSHROOMS  
(*AMANITA MUSCARIA*) DEADLY POISON

3. If they grow on the trunk of another tree they steal the sap as it comes up to feed the tree. This sap is always moving up the tree very near the bark. The mushrooms or toadstools get a supply as the sap moves by where they are growing.

4. The mushrooms, toadstools, and all other white plants generally get their food by living on the decayed parts of other plants. You will mostly find them growing on the

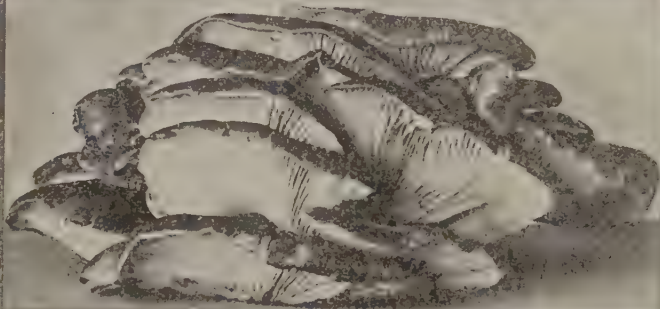
decayed part of a log that has been lying on the ground for a long time.

5. These white plants do almost as much good as the crayfish do in the water, or the buzzards on the land. The crayfish eat the decayed matter in the water, the buzzards eat the decayed animal matter which they can find scattered over the land, and the white plants use up the decayed vegetation.

6. Edible mushrooms are very good food but it is very dangerous to eat them, as poisonous fungi may be mistaken for them. There are many white plants which look very much like the mushroom but which are very poisonous. Even people who know edible mushrooms well have difficulty in distinguishing them from some poisonous plants.

7. Mushrooms grow from spores. These spores are very small and look like tiny scales or grains of dust. These spores drop from the plant to the ground when the mushroom is ripe. They are so small it is almost impossible to see them with the naked eye. As soon as these spores fall to the ground they send out very delicate and slender roots into the decayed vegetation on which they grow. When

these roots are large enough the mushroom begins to grow. When the mushroom first appears above the ground it looks like a tiny white ball. It grows very rapidly and at last spreads out its flat top.



#### EDIBLE MUSHROOMS.

Do not accept mushrooms from a self-styled expert. Learn them yourself.



8. Mushrooms and toadstools are not always white. As the plant gets older the gills, which are the thin leaves under the flat top, sometimes change to a darker color. The umbrella top may become a brownish or reddish color as it ripens.

9. These gills look much like the leaves of a book, they are so thin and so close together. Just below these gills you will find a ring. This ring is a part of the umbrella top which clung to the stem before the top was opened out. This ring is the part or edge of the umbrella which was broken off when the umbrella was opened.

10. Mushrooms grow very rapidly and are raised by many people for the market. They will grow readily in cellars and bring a good price in the market. The cultivated mushroom, however, is surpassed in flavor by many other species.

11. The poisonous species are commonly known as *toad stools*, and as many of these resemble the edible mushrooms very great care should be exercised in gathering mushrooms for use as a food. It is difficult to give a definite rule to follow in determining the edible forms, but the following characteristics of the poisonous forms should be observed:

## AVOID



MUSHROOM  
(*AMANITA PHALLOIDES*)  
DEADLY POISONOUS

AVOID fungi when in the unexpanded or button stage, and those in which the flesh has begun to decay; all that have death-cups, stalks with a swollen base surrounded by a scaly or sac-like envelope, especially if the gills are white; all fungi in which the cap is thin in proportion to the gills, and in which all the gills are nearly equal in length, espe-

cially if the cap is bright colored; all tube-bearing fungi in which the flesh changes color when broken or cut, or where the mouth of the tube is reddish; all fungi that have a sort of spider-web ring, like a tuft of wool or wax around the upper part of the stalk. Do not collect mushrooms in or near wooded areas except for study purposes. *Experiment with caution.*

## QUESTIONS

1. How do white plants grow?
2. What kind of seeds do they have?
3. Are mushrooms always white?
4. What are the gills?
5. What is the ring and what causes it?
6. Why is it dangerous to gather mushrooms for food?
7. What is the appearance of mushrooms when they first come above the ground?
8. Where may they be grown?
9. What are the spores and when do they appear?

## LESSON X

## THE BLUEBIRD

|           |         |             |
|-----------|---------|-------------|
| messenger | porches | possession  |
| chance    | bronze  | distinguish |
| beautiful | mottled | interesting |

1. The bluebird is the messenger that tells us when spring is coming. The robin may come in the spring before the bluebird, but there may be much winter after he comes. The bluebird never comes until spring is very near.



BLUEBIRD

2. The bluebird is like the robin in many ways. He has a reddish breast and a beautiful song, but he is not nearly so large, and has blue on his back, head, and wings. In Europe the bluebird is called the blue-robin. The baby bluebirds are mottled in color just like robins.

3. The male bluebird is much brighter in color than his wife. Just after the bluebird returns from his winter home in the south, his song is most beautiful. When he and Mrs. Bluebird begin to care for their nest and their little baby bluebirds, they sing very little.

4. Before bluebirds mate, they go about in small flocks of six or eight. After they mate, each pair goes off by itself and begins to look for a good place to build a nest. They are much pleased if they can find a hole in an old apple tree in the orchard.

5. Here they make their nest out of fine grass and in it the mother bluebird lays four or five light-blue eggs. Bluebirds are also happy to find a good bird box which some boy has made for them, if he has made it properly.



HOMES FOR GARDEN PROTECTORS—THE BIRD BOXES  
MADE BY PENNSYLVANIA SCHOOL CHILDREN

6. This bird box should be eight by nine inches across the bottom by six inches high. These boxes should never have a porch at the entrance to the nest. If English sparrows find a bird box with an entrance near the limb on which it is fastened, or a porch at the entrance, they generally take possession of it. They do not care for homes without a place to perch near the door.

7. Bluebirds are very useful because they destroy very many injurious insects and bugs. It is very interesting to watch these bluebirds catch insects. The bluebird will take his posi-

tion on a limb of a tree near the ground. Soon you will see him suddenly dart to the ground and get an insect that he has been watching from his position on the limb. Sometimes he will catch flies and insects as he flies through the air. The bluebird never walks around on the ground hunting for food like the robin.

8. Bluebirds like berries and weed seeds but they like insects best. Farmers are very anxious to have many bluebirds build their nests in their orchards because they kill many insects that harm their crops.

9. In addition to building bird boxes for the bluebirds, bird baths should be placed so high that cats cannot attack the birds when they are bathing. This bird bath may be a shallow pan in which is water about one inch deep. There are very few



A BIRD BATH

cats that will not kill birds if they get a chance, and the bird cannot watch them very well while it is bathing.

### QUESTIONS

1. What is the bluebird called in Europe?
2. In what ways is the bluebird like the robin?
3. Where does the bluebird stay during the winters?
4. When can you find bluebirds in flocks and when in pairs?
5. Where does the bluebird like to build its nest?
6. How many eggs does the bluebird lay and what color are they?
7. Describe how a bird box should be built for bluebirds.
8. Of what use are bluebirds?
9. How does the bluebird catch its prey?
10. What does the bluebird like best for food?
11. What is the color of the bluebird? What is the color of the baby bluebirds?





Photographed in colors from mounted specimens. A. E. Shirling collection, Kansas City, Missouri

*VICEROY (above), Mimic of the Monarch*

*The Monarch is distasteful to birds. The Viceroy mimics the color of the Monarch for protection.*

*MONARCH BUTTERFLY, (below)*

*"Its wings so bright with golden light,  
Say, is it not a pretty sight?"*

## LESSON XI

## THE MONARCH BUTTERFLY

|               |            |            |
|---------------|------------|------------|
| knob          | milkweed   | odor       |
| molest        | chrysalis  | brilliance |
| detect        | attract    | slight     |
| distinguished | appearance | visits     |

1. The large monarch butterfly is a very common butterfly. It is black and bronze in color. It can easily be distinguished from other butterflies by the black tips on its front wings, which are marked with yellow dots. It also has beautiful yellow markings on both its front and back wings and two rows of white dots around the outside.

2. The monarch butterfly has six legs, two of which are very short. It has a very long tongue. What can it do with such a long tongue? Watch it as it visits a flower. You will see it alight on a flower, uncoil this long tongue, which it always keeps rolled up except when it is using it, and thrust it down into the center of the throat of the flower. This is the way it is able to get the nectar out of a flower that has a long throat or neck.

3. If you will examine the long hairs, or feelers, which it has, you will find a little knob on the end of each one. You can easily distinguish moths from butterflies by this knob. Moths do not have these knobs on any of their feelers. They may also be distinguished by the way they hold their wings while at rest.

4. On one of the veins on the back wings of the male monarch you will find a small dark colored scent spot. This scent spot is to attract its mate, yet people can scarcely detect any odor coming from it. Butterflies must be able to detect slight odors very easily. This ability helps them locate flowers by their odor.

5. The dust which clings to your fingers when you touch the butterfly's wings is small scales which cover the greater part of it.

6. The baby butterfly is a caterpillar. It is called the milkweed caterpillar because it is not found on any other plant except the milkweed. This caterpillar grows to its full size in two weeks. Its colors are very brilliant and beautiful. It is green in color with cross-stripes of orange and black. Its color is much the same as the weed on which it lives. This

is no doubt to protect it from its enemies. It is not easy to locate a green worm on a green plant.

7. This caterpillar is one of the few worms that birds will not touch. Birds will not molest the monarch caterpillar, chrysalis, nor butterfly. They do not seem to like their flavor.

8. The caterpillar and chrysalis are simply younger stages of the butterfly. Although this caterpillar is not injured by birds, yet it is annoyed very much by flies. These flies want to lay their eggs on its back, where they will hatch in a few days. To protect itself against these flies, it has two pairs of horns, which it uses just about as a cow uses her tail when flies annoy her. •

9. When the caterpillar becomes a chrysalis, it does not seem to lose any of its brilliancy. You will find this to be true if you will examine a chrysalis which you may find clinging to the rails of old fences or to the leaves of trees.

10. If you are able to get a chrysalis, be very careful that you do not injure it so that you may see it develop into a butterfly. It

remains a chrysalis about two weeks, then the large beautiful monarch butterfly is born.

### QUESTIONS

1. Describe color of monarch butterfly.
2. How may butterflies be distinguished from moths?
3. What is the baby butterfly called and what is its appearance?
4. Where does this baby butterfly live?
5. What are its enemies and how does it protect itself?
6. How long does the butterfly remain a caterpillar and how long a chrysalis?
7. What are scent spots and of what use are they?
8. What kind of a tongue has the monarch and for what is it used? What are feelers?
9. On what plant does the monarch caterpillar live?

### BUTTERFLIES

|                         |                                   |
|-------------------------|-----------------------------------|
| Angel Wings Butterfly   | Orange Butterfly                  |
| Banded Red Butterfly    | Red Admiral Purple Butter-<br>fly |
| Clover Butterfly        | Red Spotted Butterfly             |
| Hair Streaks Butterfly  | Skipper Butterfly                 |
| Laertes Butterfly       | Swallow Tail Butterfly            |
| Lyca Butterfly          | Tiger Swallow Tail Butterfly      |
| Malachite Butterfly     | Tropic Queen Butterfly            |
| Monarch Butterfly       | Zebra Butterfly                   |
| Morning Cloak Butterfly |                                   |

## LESSON XII

## THE PINE TREE

center

circle

determined

trunk

moisture

cypress

hemlock

cones

divides



PINE NEEDLES

1. The pine tree is different from most other trees in two ways. Its leaves are always green and its stem or trunk does not often split into branches. If the leaves of the pine tree were flat, they would likely drop off like most other leaves when cold weather comes. When leaves are large and flat they lose a great deal of water through evaporation from their pores. The narrow, needle-like leaves of the pine have a thick covering and the pores are sunken so deeply that they give off but little water.

2. In cold weather the air is very dry and the water cannot well circulate through the



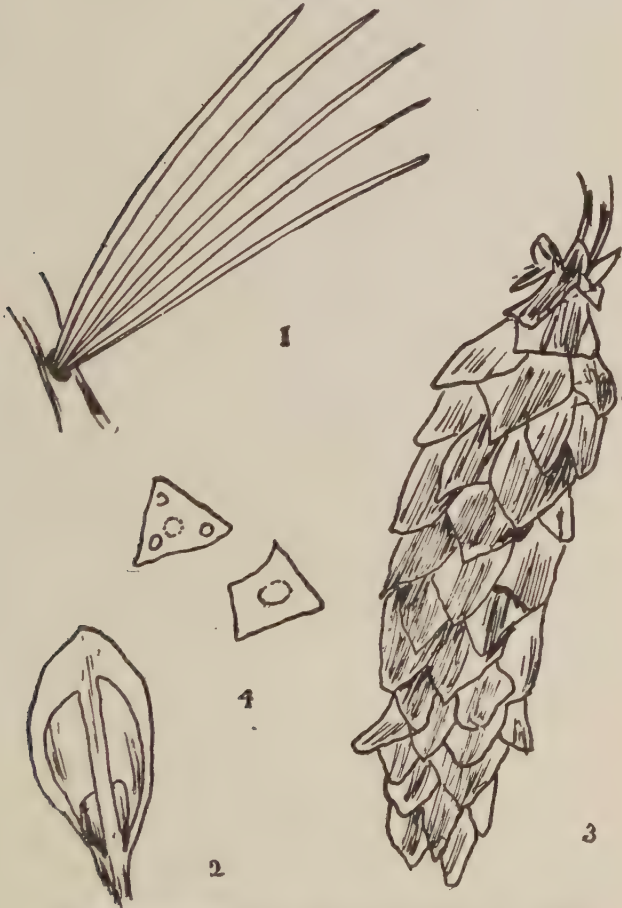
### WHITE PINE NEEDLES, CONE, AND SEED

Trees used for lumber, reforestation, and to ornament lawns

- |                                              |                            |
|----------------------------------------------|----------------------------|
| 1. Branch with sterile flowers               | 6. Cone                    |
| 2. Stamen                                    | 7. Cross-section of needle |
| 3. Branch with fertile flowers               | 8. Cone-scale with seeds   |
| 4. Bract and ovuliferous scale, outer side   |                            |
| 5. Ovuliferous scale with ovules, inner side |                            |

See page 76 for description

twigs, and the leaves drop off in order to keep the twigs and buds from drying up. This is



WESTERN WHITE PINE NEEDLES, CONE, AND SEED

Trees used for lumber and lawn trees

1. Cluster of needles

3. Cone

2. Seeds on scale

4. Cross-section of needle

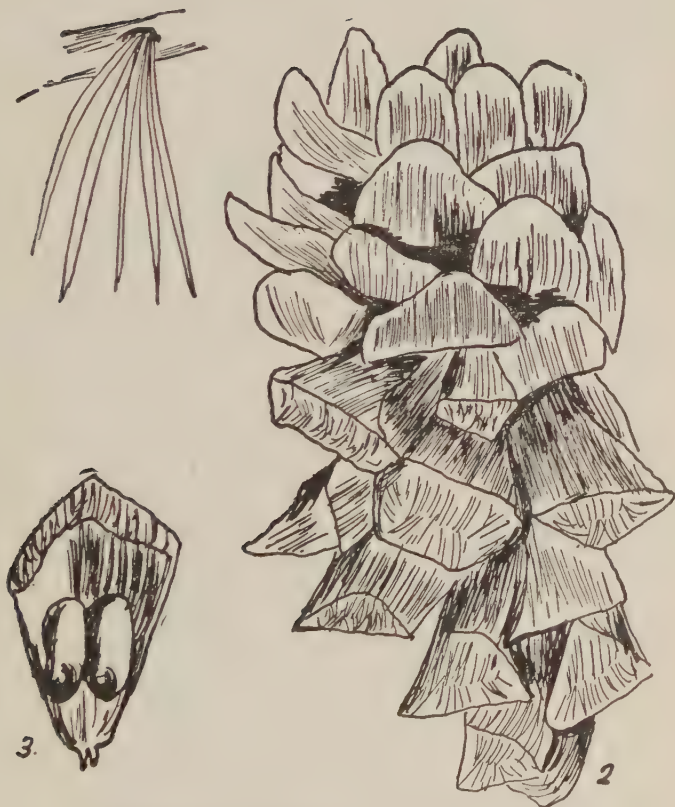
See page 77 for description

true of all broad-leaved trees with a few exceptions, as the Live Oak.

3. The stem of the pine tree does not split into branches like the apple tree or the oak, but keeps its trunk straight to the very top of the tree. Sometimes it divides near the top into two stems. There are many branches which grow out from the sides of the trunk, but these are not large when compared with the size of the trunk. These grow in circles of branches around the tree.

4. At the tip of each branch and at the top of the tree there are three or four buds. One of these will always be in the center of the others. These buds will grow into branches. The one in the center is the one which will keep the branch or the tree growing straight and the others will form the circle of branches around it.

5. It may easily be seen that there will be one year's growth between each circle of branches and the circle above it. The tree will then be as many years old as there are circles of branches around its trunk. So if the number of circles of branches around the trunk is known, we know the age of the tree.



LIMBER PINE NEEDLES, CONE, AND SEED

Trees used for lumber

1. Cluster of needles

2. Cone

3. Seed on scale

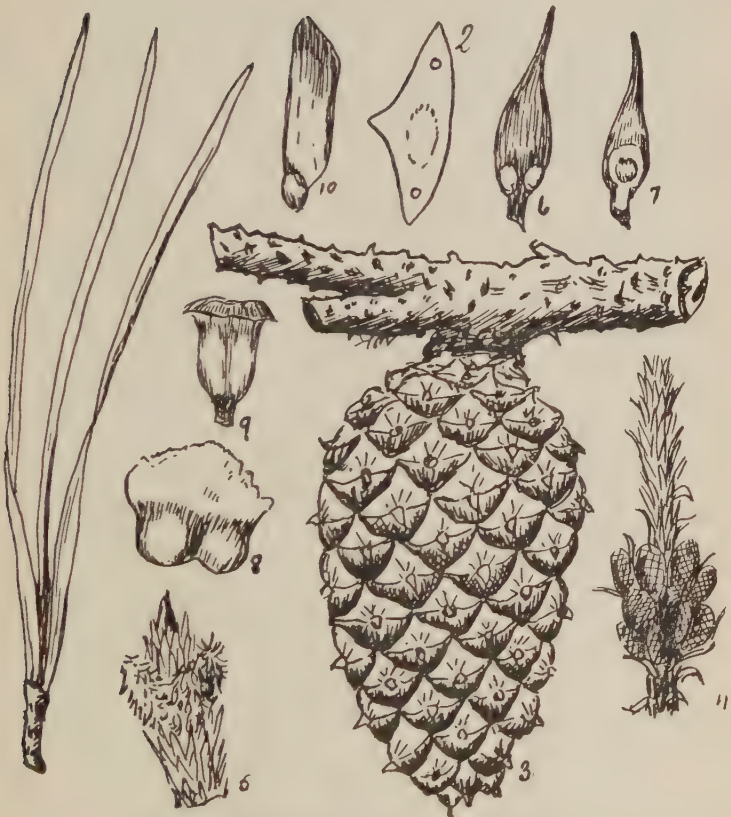
See page 77 for description

6. If pine trees that are five or six years of age, or that have grown close together as in the forest, are examined, many of the under branches will be found dead. These die because they cannot get enough sunlight and moisture. When a branch grows out from the trunk of the tree it never gets any higher up from the ground. Other branches grow out above it in circles. These upper branches at last take all of the sunlight and the limbs below must die and drop off.

7. The tree grows higher because new growth is added to the top. If a nail were driven into the trunk of a tree, and allowed to remain in the tree for several years, it will be easily seen how the tree grows. The nail will be no higher up than when it was driven into the tree.

8. Compare the circles of branches on an old pine tree and those on a young pine tree. The circles on the young pine tree will be found to be much closer together than those on the older tree. This is because many branches drop off as the tree grows.

9. The leaves of the pine tree are much like needles and remain on the tree for years.



PITCH PINE NEEDLES, CONE AND SEED

Trees used for fuel and reforestation

1. Cluster of needles
2. Cross-section of needle, enlarged
3. Cone
4. Branch with sterile flowers
5. Branch with fertile flowers
6. Fertile flower, showing ovuliferous scale, inner side
7. Fertile flower, showing bract, outer side
8. Stamen, top view
9. Stamen, front view
10. Seed

See page 78 for description

The leaves are as old as the branches on which they grow, and die when the branches die.

10. The rough pine cone is the home in which the seed lives. It takes the pine cone about one and one-half years to grow and ripen. It ripens in the autumn and falls to the ground.

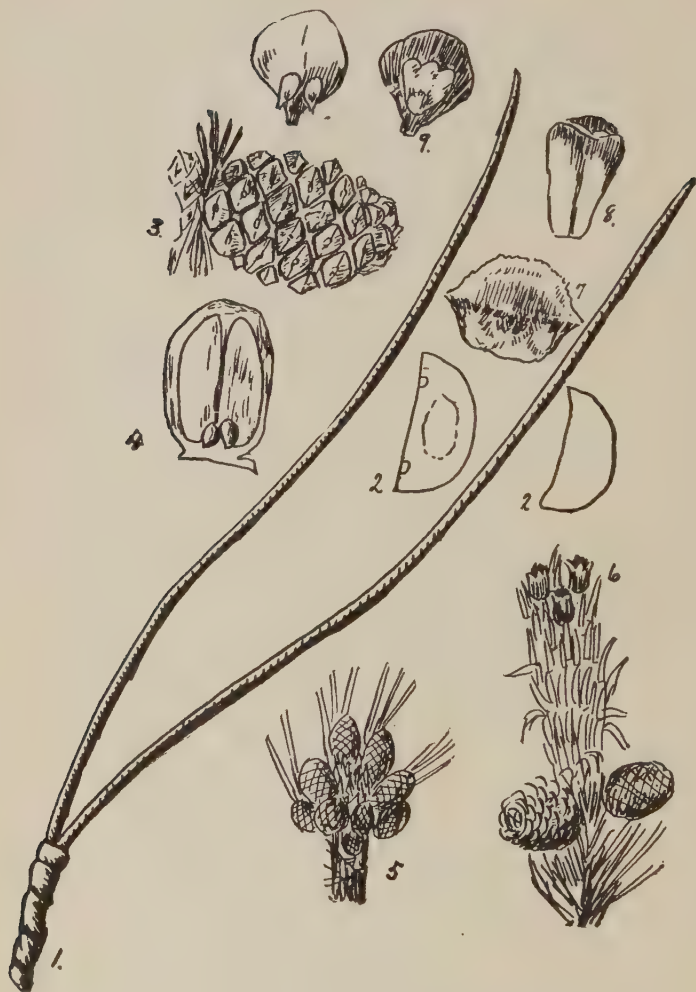
11. By cutting away the lower, or large, end of the cone, the rough scales may be taken apart very easily and the seed examined. Each seed has wings which are kept folded up under the scales until the seed ripens. Some time during the autumn or winter the cone will become dry and the scales will drop off.

12. When these scales drop off the seeds are set free. The wind will sometimes carry these seeds quite a distance from the mother tree. Here, at last, they will fall to the ground and later grow into pine trees. Many evergreen trees, like the cypress, spruce, hemlock, and fir, grow their seeds in cones much like the pine tree.

#### QUESTIONS

1. In what way does the pine tree differ from most trees?

2. Why do some leaves drop off and others stay on the tree?
3. How does the trunk of the pine tree differ from the trunk of the apple tree?
4. How do the branches of the pine tree grow?
5. How can the age of the pine tree be determined?
6. Do the limbs that grow out from the trunk of a young tree close to the ground ever get any higher?
7. Why do the circles of branches in an old tree grow farther apart than in a young tree?
8. How long do the leaves of the pine tree remain on the tree?
9. How may the pine cone be taken apart?
10. Explain how the seeds of the pine tree grow and how they are scattered.



### RED PINE NEEDLES, CONE AND SEED

- Trees used for lumber, piles. Bark is used for tanning.
- |                            |                                                 |
|----------------------------|-------------------------------------------------|
| 1. Needles                 | 6. Branch with fertile flowers and young cones  |
| 2. Cross-section of needle | 7. Stamen, top view                             |
| 3. Cone, reduced size      | 8. Stamen, front view                           |
| 4. Seed with cone scale    | 9. Ovuliferous scale, outer side and inner side |
| 5. Sterile flower          |                                                 |

See page 78 for description



NORTHERN SCRUB PINE NEEDLES, CONE, AND SEED

Trees used for lumber, fencing, and railway ties

- |                                       |                       |
|---------------------------------------|-----------------------|
| 1. Cluster of needles                 | 5. Flowers, sterile   |
| 2. Cross-section of needles, enlarged | 6. Flowers, fertile   |
| 3. Cones                              | 7. Stamen, front view |
| 4. Cone scales with seeds             | 8. Stamen, top view   |

See page 79 for description



### RED SPRUCE NEEDLES, CONE AND SEED

Trees used for paper pulp, square timber and sounding boards for instruments

- |                                      |                                  |
|--------------------------------------|----------------------------------|
| 1. Fruiting branch                   | 6. Ovuliferous scale, inner side |
| 2. Branch with sterile flowers       | 7. Leaf                          |
| 3. Branch with fertile flowers       | 8. Seed                          |
| 4. Cross-section of needles          | 9. Stamen, front view            |
| 5. Cover-scale and ovuliferous scale | 10. Stamen, side view            |

See page 79 for description



## EASTERN HEMLOCK NEEDLES, CONES, AND SEED

Trees used for coarse lumber, railway ties, lawns and hedges

- |                            |                                 |
|----------------------------|---------------------------------|
| 1. Branch with flower buds | 6. Sterile flowers              |
| 2. Needle                  | 7. Scale with ovule, inner side |
| 3. Cross-section of needle | 8. Spurred anther               |
| 4. Fruiting branch         | 9. Branch with fertile flowers  |
| 5. Cone scale with seeds   | 10. Branch with sterile flowers |

See page 80 for description

LESSON XII—*Continued.*

## EVERGREEN TREES—IDENTIFICATION AND USE

What the apple is among the fruits, what the oak is among broad-leaved trees of the temperate zone, the pines are among the conifers, excelling all other genera in this most important family in number of species, in extent of area occupied, in usefulness, and importance to the human race.—*Fernow.*

**WHITE PINE**—Bluish-green needles, slender and soft, five in a cluster, 3 to 5 inches long. See page 64.

*Found*—From Newfoundland to Manitoba, in the east, southward to Tennessee and Georgia. At one time common from Nova Scotia to Manitoba.

*Habit*—Tall and stately, ordinarily 50 to 80 feet high and 2 feet in diameter, sometimes reaches a height of 200 feet and a diameter of 10 feet. It does not thrive on a wet clay subsoil.

*Use*—For lumber, cabinet making, interior finish of houses, masts of vessels, reforestation, and as an ornament in lawns.

**WESTERN WHITE PINE** — Bluish-green needles, five in a cluster,  $1\frac{1}{2}$  to 4 inches long. See page 65.

*Found*—From northern Montana to southern British Columbia and Vancouver Island, southward to south-central California.

*Habit*—A spreading tree with stout trunk and slender, drooping branches. It is often 100 feet high; has a diameter of 4 to 5 feet.

*Use*—For lumber. In the east seedlings are grown in the nurseries and make fine lawn trees.

**LIMBER PINE**—Dark green needles in clusters of five, thick and rigid,  $1\frac{1}{2}$  to 3 inches long, dropping in the fifth or sixth year. See page 67.

*Found*—From Alberta westward to British Columbia, southward to southeastern California and western Texas.

*Habit*—Broad, stout trunk, 40 to 75 feet high with ascending branches.

*Use*—For lumber, particularly in semi-arid regions where other trees fail to grow.

**PITCH PINE**—Dark yellowish-green needles, stout and stiff, three in a cluster, 3 to 5 inches long. See page 69.

*Found*—Valley of the St. John river in New Brunswick to the northern shores of Lake Ontario, southward to Georgia and Alabama, westward to Tennessee and Kentucky.

*Habit*—Usually a low tree 50 to 60 feet high and a diameter of 1 to 2 feet. Trunk short and straight, or somewhat twisted.

*Use*—For fuel and for holding sandy soil in place against the actions of the winds. Valuable for the reforesting of poor wornout lands of mountain sides.

**RED PINE**—Dark green needles in clusters of two, 4 to 6 inches long. See page 72.

*Found*—In the northern states from the Atlantic to the middle-west; southeast in Pennsylvania and Massachusetts; Newfoundland westward from Nova Scotia to Manitoba. Grows rapidly in cultivation.

*Habit*—One of the most beautiful of the pines. Trunk straight, scarcely tapering, 50

to 75 feet high, 2 to 3 feet in diameter at the ground.

*Use*—Chiefly for lumber, bridges, masts, spars and piles. One of the most hardy of the cone bearing trees. The bark is sometimes used for tanning.

NORTHERN SCRUB PINE—Needles in clusters of two,  $\frac{3}{4}$  to  $2\frac{1}{2}$  inches long, stout, curved, dark grayish-green. See page 73.

*Found*—From Maine, New Hampshire and Vermont westward to northern Indiana, Illinois and Michigan; Nova Scotia westward to the Athabaska river.

*Habit*—Variable in habit. In poor soil it may be shrubby and the trunk crooked. In good soil with protection from winds, it is straight, slender and tapering.

*Use*—For lumber, fencing, railway ties, and farm building.

RED SPRUCE—Needles straight, 4-sided,  $\frac{1}{2}$  inch long, pale bluish-green at first, dark, shining green when mature. See page 74.

*Found*—From Ontario eastward to Nova Scotia, southward to North Carolina and Tennessee.

*Habit*—Trunk straight, 1 to 2½ feet in diameter, tapering. A hardy tree 40 to 75 feet high. The lower branches sometimes rest on the ground, the upper branches rise toward the light and form a narrow, conical head. Its cones are large and fall off the tree the first winter, while the cones of the black spruce stay on the tree for many years. It lives to a great age.

*Use*—The wood is used for paper pulp, square timber, joists, scantlings, and sounding boards for instruments. Valuable as an ornamental tree.

EASTERN HEMLOCK—Needles flat, dark yellowish-green, spirally arranged around the branch, but appear to be two-ranked, ½ to ¾ inch long. See page 75.

*Found*—Abundantly from Nova Scotia to Ontario, southward to Michigan, Wisconsin, Georgia and Alabama. On the mountains of North Carolina and Tennessee it reaches its largest size.

*Habit*—Straight and tapering, 50 to 80 feet high, 2 to 4 feet in diameter. Branches

at right angles to the trunk, the lowest branches drooping. Dense foliage. One of the most beautiful cone bearing trees.

*Use*—For coarse lumber, outside finish and railway ties. Pitch and opaque resin are made from the wood, and oil of hemlock distilled from the young branches. The bark is used in tanning and is the chief commercial product of the tree. Valuable for ornamenting parks, lawns, and for hedges.

## EVERGREEN NEEDLES

Five needles in each bunch: White Pine; Western White Pine; Limber Pine.

Three needles in each bunch: Pitch Pine; Yellow (Georgia) Pine.

Needles in pairs: Red Pine; Northern Scrub Pine; Norway Pine.

Needles in two rows: Balsam Fir.

Needles flat and spirally arranged around the branch, but appear to be two ranked: Eastern Hemlock.

Needles four sided, growing around the branch: Red Spruce.

The Larch, Tamarack or Hackmatack has deciduous needles.

## LESSON XIII

## THE SKUNK

grunt

disagreeable

rocks

avoid

roams

surface

awkward

protect

generally



SKUNK

1. If we have any wild animals that are not *wild*, the most important one is the skunk. It does not seem to be afraid of anything. The skunk is a very odd little animal about one and one-half feet long, including its tail, which is very bushy. It has long fur which is

generally black in color with white on its face, the back of its head, and two white stripes along its back.

2. The skunk does not often make any sound, and when it does it is a very low grunt which can only be heard when one is very close to it.

3. It cannot fight, and does not need to fight, although it roams about at night when other wild animals are generally out hunting their prey. It has a small scent bag which it carries near its tail. When it thinks there is danger near, it throws some of this scent liquid from its ever ready scent bag into the bush of its tail and then begins to throw it into the air just as a boy might throw water into the air from a broom.

4. Although there is not more than a drop or two of this scent liquid on its tail when it begins to throw it about, yet the disagreeable odor can be detected almost a mile away. This liquid is squeezed out in a fine spray through a tiny opening in the scent glands, by muscles at the base of the tail.

5. All animals avoid this very disagreeable odor. There are very few dogs that are brave

enough to attack the skunk because they cannot endure this odor. The protection afforded by this odor causes the skunk to wander about without fear of enemies. It seems to know that all animals dislike it and will keep out of its way.

6. The food of the skunk is insects, bugs, mice, birds that nest on the ground, and sometimes chickens.

7. The skunk makes its home in the ground much like the woodchuck. This burrow it digs with its sharp, front claws. It may sometimes make use of the woodchuck's burrow or find a hole among the rocks in a cave. It has been known to make its home under an old shed or barn.

8. When making its burrow in the ground it will dig out a small room, well under the surface. Here the mother skunk makes a nest out of fine dry grass for the little baby skunks. These baby skunks come in May, and look and act very much like kittens. The mother skunk is careful to keep her home very neat and clean.

9. The skunk has a very odd gait. Its fore legs are much shorter than its hind legs.

When it travels, it jumps along in a very awkward manner. It does not run on its toes, but places its heel and its toes on the ground at the same time. Its track looks very much like the track a boy might make in his bare feet except that the skunk makes a double track. It generally jumps with its left feet a little ahead of its right feet.

10. If you were to come close to a skunk it would not likely run away, because it is not afraid of anything. If you come too close to it, it will make a low grunting sound and throw its bushy tail into the air like a flag. It does this that it may be ready to throw its liquid scent into the air quickly if danger comes.

11. The mink and the weasel protect themselves by a similar odor when they become angry or when they think danger is near. But the skunk's odor is much stronger than that of the mink or weasel.

12. The skunk is a very useful animal because it destroys many injurious insects and many mice. Its fur is also very valuable. The fur of a skunk will sell for as much as ten dollars if it is dark in color and is not injured.

## QUESTIONS

1. Describe the appearance of the skunk.
2. What sound does the skunk make?
3. How does the skunk protect itself?
4. When do skunks hunt their food?
5. Describe their home and how they keep it.
6. How does the skunk run and what kind of a track does it make?
7. When do the baby skunks come?
8. How strong is the scent which the skunk makes when it thinks danger is near?
9. What other animals protect themselves in a manner similar to the skunk?
10. Of what use is the skunk?

## LESSON XIV

## THE ONION

|           |             |         |
|-----------|-------------|---------|
| potato    | canna       | liquid  |
| tough     | nourishment | absorb  |
| furnish   | hyacinth    | example |
| vegetable | exposed     | bulb    |



1. Most people think when they eat onions that they are eating the root of the onion. What they eat is not the root, but the stem and the leaves. The stem

seems to have been pushed together endways. This makes the leaves lie close together.

2. The shortened stem and leaves that people eat is called the bulb. Gardeners keep this bulb well covered with earth while it is growing to keep it tender. The onion not only remains tender when covered with earth, but remains white, and never turns green like the top. No kind of vegetable will turn green

unless exposed to the sunlight. This is why the sprouts of potatoes that are kept in the cellar are white.

3. Although the part which people eat is not the root, yet the onion has many roots. These roots are very fine and grow out from the lower end of the bulb. These fine hair roots absorb nourishment in a liquid form from the ground and send it up into the bulb and leaves of the onion.

4. The food of the onion must be in a liquid form because if it were not it could not pass up into the bulb nor the leaves. The soil furnishes the food, and the rain makes it into a liquid form. We can easily see why plants do not grow well in dry weather and why people must water house plants that get no rain.

5. The onion plant has flowers and seeds very much like other plants. Some kinds of onions grow small bulbs, or sets, on the top of the seed stock instead of seed. These bulbs are called "top sets," and may be planted between August fifteenth and September fifteenth, and will make "winter onions" until the snow falls. The ones that are left in the

ground will come up about the end of February and are called "early spring onions." The "bottom sets" are the small onions grown from seed, and are not allowed to grow large by planting the seed very thick. These little onions, or "bottom sets," are planted in the spring and grow to be big onions. When these big onions stay in the ground until August or September they grow seed on the top of the seed stock.

6. Onions grow from bulbs more rapidly than they do from seed. This is because when a seed is planted it must wait until it has roots before it can grow much. When a bulb is planted it can begin growing at once because there is enough food stored up in the bulb to keep it growing well until it has roots large enough to furnish food. It is this bulb in which the food is stored, that people eat.

7. The onion seems to be very wise in storing up food in its bulb. It can either use this food until its roots grow or it can use this food in times of very dry weather when its roots get no liquid nourishment from the ground.

8. Very many plants store up food in bulbs, or around their seeds, so that the plant

may grow rapidly until its roots are large enough to furnish the food the plant needs. The corn and the bean are good examples of food stored up around the seed. The canna and the lily are examples of plants which store up food in bulbs.

9. If seeds that have no food stored up around them are planted at the same time that other seeds which have food stored up around them are planted, the wisdom of storing up food in the plant can easily be noticed. The plants with food, like the bean, will grow much more quickly and grow stronger than those that have no food to feed them until the roots furnish it.

#### QUESTIONS

1. What part of the onion do people eat?
2. Why is this part white?
3. What makes plants green?
4. Why do plants not grow well in dry weather?
5. What are onion "sets"?
6. What kind of onions do people plant?
7. What is the cause for corn and beans coming up through the ground very soon after they are planted?
8. Name two other plants that store up food in their bulbs.

## LESSON XV

## THE HONEYBEE

comb  
hive  
drones

workers  
independent  
nectar

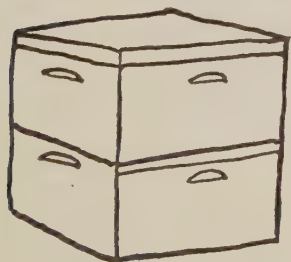
tongue  
cells  
valuable



HONEYBEE

1. Almost everyone has eaten honey. This honey is made by bees. These bees know how to make wax as well as honey. With this wax they make little cells into which they put the honey. These cells are called the comb.

2. Many people make wooden boxes about one foot and a half square on the bottom and two feet high in which the bees can build their comb. These wooden boxes are called the hives.



BEEHIVE

3. There are three kinds of bees. These are the father bees, the workers, and the queen. The queen bee is the ruler of the hive. It is also the mother and lays the eggs in the cells. It never does any work. There can be

but one queen or ruler in a hive at one time. If another queen should come to the hive, it and the queen of the hive must decide by fighting which shall be ruler. In this fight each one tries to sting the other near where the wings grow to the body. This will kill the bee, and the other becomes the ruler of the hive.

4. If new queens hatch out of the cells the old queen stings them so that they die. It wants to remain the ruler of the hive. When it was made queen of the hive it came out of the hive into the sunlight for a short time. This was soon after it was hatched and it wanted to dry its wings in the sunlight.

5. The wings of the queen never grow so large as the wings of the workers, because it does not use them so much. After it has been in the sunlight a short time it returns to the hive and does not come out again until the next spring. This time the old workers follow it to a new hive.

6. If the bees cannot find a box in which to build a nest made out of cells they may make their home in a hole in some hollow tree.

7. The queen's reason for leaving the old hive is to get away from the new queens that are beginning to hatch, and that it cannot kill. It would kill them if it could, but sometimes the workers get in its way and keep it from harming them. If they do this, it will leave and take the old workers with it.

8. The father bees are called drones, and, like the queen, never do any work. They walk about the hive and seem very independent. These drones are the only bees that cannot sting.

9. The workers are the third kind of bees. There are a great many of these. They are divided into two classes: the nurse bees that take care of the baby bees, and the bees that build the cells and gather honey.

10. A short time after the queen bee lays its eggs in the cells, these eggs hatch out into little worms. These worms are called grubs. These grubs will later turn into bees. While these grubs are shut up in the cells they grow to be real bees.

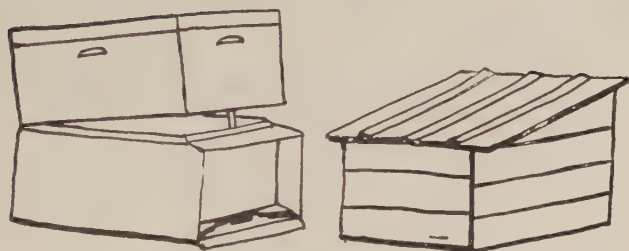
11. When the grubs have become bees and have legs, wings, and fine hairs on their legs and body, they are ready to come out of the

cell. The nurse bees care for them and see that they are kept from harm. They see that these baby bees get their food and that the grubs which are to grow into queens are placed in larger cells than the others. There are always a few of these large cells in each hive. As soon as the workers are fully grown, they begin at once to gather honey. The queen bee sometimes kills the young queens against the will of the nurse bees, but the nurses will protect them if they can.

12. The oddest thing about the bee is its long tongue. With this long tongue it sucks the nectar out of the flower much like a boy drinks soda water through a straw.

13. The work bees that build the cells and gather the honey carry two bags. Into one of these bags the bee puts pollen which it gathers from the flower, and into the other it puts the nectar which it gets with its long tongue. It mixes some of this pollen with the nectar to make the wax which it uses to build the cells. It also gives the pollen to the nurse bees to feed the grubs.

14. If another insect or worm should come into the hive to steal some of the honey the



BEEHIVES

bees will sting it to death and carry it out of the hive if they can. If it is a caterpillar and too large for them to carry out they will cover it all over with wax. This is their way of burying it.

15. In July the workers will kill all of the drones. They then begin to store up honey for food during the winter. During the cold weather the bees sleep most of the time. When they awaken they want enough honey to eat until the warm weather comes and the flowers begin to bloom.

16. The bees are very valuable and useful. They will sting no one unless they are harmed.

17. A hive usually consists of one mother, or queen, from 600 to 800 males or drones, and from 15,000 to 20,000 working bees. The working bees are the smallest.

## QUESTIONS

1. How many kinds of bees in a hive?
2. What is a cell? A hive?
3. How large should a hive be?
4. How many queens in a hive? Why are there not many more?
5. What are grubs and where do they live?
6. What is the work of each class of bees?
7. Does the queen ever leave the old hive? Why?
8. How do the workers carry the honey?
9. What do the bees do if a robber should come into their hive?
10. How do the bees make their cells?
11. How do bees live through the winter?
12. Of what use are bees?

## LESSON XVI

## THE BOBOLINK

meadow  
blade  
braids

probably  
countless  
buff

fringed  
utter  
clouded



BOBOLINK

1. If you walk through the meadow some warm spring morning you will find the beautiful and gay "Robert of Lincoln." This is a title by which Mr. Bobolink is known. You must watch very closely to see him because he would much rather be heard than seen. You

will probably see him perched on some tall weed or on the fence.

2. You will also hear him tell his name very plainly as he sings, "Bobolink, Bobolink, Spink, Spank, Spink." He never flies very high up in the air, but he often sings as he flies.

3. The bobolink is a little larger than the sparrow and both the male and female are very beautiful. The male, in the early spring, is black with a yellow spot on the back of his neck. His wings and tail are also fringed with yellow markings. The upper part of his wings and tail are trimmed with white and buff. Toward the late fall the bobolink changes his suit to look very much like his wife.

4. The female wears a brownish-yellow suit trimmed with dark brown and black. On the top of her head are two black stripes which make her look as though she were trying to put her hair up in braids.

5. The bobolinks stay in the northern part of the United States and southern Canada only during the warm months. During the winter, they stay in the southern states and in

South America. They come north in May and return to their winter home about September.

6. Mr. Bobolink and his mate build their nest well out of sight in the tall grass. Here the female lays from four to six bluish-white eggs which are clouded with brown. While she sits on the eggs, Mr. Bobolink is perched on some tall weed or blade of grass some distance away keeping guard and singing for her entertainment.

7. His song is very beautiful, but if an enemy approaches he will utter a coarse "chaw." As soon as she hears this she obeys at once and off they go to some safe hiding place.

8. The bobolinks are very valuable birds to the gardener and farmer because they destroy many insects which are harmful to growing crops. They like spiders, grasshoppers, and beetles best, and eat great numbers of them. They also eat countless weed and grass seeds when it is difficult to get insects.

9. When September draws near, they get ready for their journey southward. During September they start for the rice fields of the

south. They always fly during the night and rest during the daytime. They probably do this in order that they may not be seen.

10. When they get to the Southland, they feed on the rice in the rice fields. Here their habit of keeping out of sight serves them well because they are shot for food by the southern people. It is no wonder they seem to feel sad and neither sing nor put on their beautiful clothes during their stay in their winter home.

#### QUESTIONS

1. Where may the bobolink be found in the spring and where will it likely be sitting?

2. Describe the colors of the male and the female. What does the bobolink eat?

3. Where do they build their nest?

4. What color are the eggs and how many are there?

5. While the female is sitting on the eggs, where is the male?

6. How does the bobolink avoid its enemies? Of what use is the bobolink?

7. When does the bobolink come north and when does it return to the south?

8. Where does it spend its winters?

## LESSON XVII

## THE CROCUS

|          |          |           |
|----------|----------|-----------|
| pistil   | gardener | tassel    |
| crocus   | corms    | sod       |
| ovary    | sepals   | petals    |
| daffodil | jonquil  | narcissus |

1. In the early spring when the snow is still on the ground we begin to wish the flowers were in bloom. We have become tired of the winter and the cold. The first flowers to make us feel happy and glad are the daffodil, jonquil, narcissus, and the crocus.

2. There are some people who cannot name these flowers when they see them. Some call the daffodil a jonquil, and some think the narcissus is a crocus. This is because they have not learned much about these beautiful visitors of the early spring.

3. The gardener who wants to have crocus bloom in his garden or lawn will plant these flowers in October. He does not plant seeds, but corms. These corms look very much like onions, but if you cut one open you will find it is not arranged in layers like an onion.

4. He plants these corms by making a small hole in the ground with a sharp stick and into this hole he places a corm. He then covers it over with sod, or earth. On this sod, or earth, he places about four or five inches of stable manure. He does this to keep these corms from getting too cold during the winter and to enrich the soil where they are to grow. In the early spring these corms begin to grow and the roots form a tassel in the center of the underside of the corm.

5. When the sprout first comes up through the ground in the spring, it looks like a green knifeblade. Toward the lower end of the sprout the color is yellow because this part has not yet received enough sunlight to make it green.

6. At the center is the flower bud that comes up through the knifeblade leaves with its overcoat on. This overcoat is not very heavy, but it is heavy enough to keep the flower bud protected until the sun gets warm enough to make the bud throw off its overcoat.

7. When the flower bud opens there will be three sepals and three petals. The sepals are



Crocus

Bulb

THE CROCUS FLOWER AND BULB

always on the outside of the petals. Both the sepals and the petals are colored. They are of different colors. Some are purple, some red, white, orange, or yellow, and some may be striped.

8. The sepals and petals grow together at the bottom into a tube. This tube extends down into the ground. On the inside of this tube, down below the surface of the ground, is a little seed box called the ovary. On the top of this ovary, and extending up through the tube, is a little straight post called the style. On the top of this style are three little knobs that are called the stigma.

9. Around this post, or style, are three stamens which seem to grow out of the upper part of the tube. On the top of these stamens are also knobs. These knobs, which are much longer than they are wide, are called anthers. These anthers furnish the dust which is called pollen and out of which the seeds grow. This pollen must get over to the stigma or knob on the top of the style before the seeds can start to grow.

10. When the anthers are ripe they shed this pollen in the throat of the flower cup.

When a bee comes to the flower to get the nectar it will crawl down into the throat of the flower and push its long tongue down into the flower tube. As it does this it gets powdered with this fine pollen dust. It then goes to another flower and does the same thing. As it crawls down into this second flower it rubs against the stigma on the top of the style and leaves on it some of the pollen. As soon as this pollen gets on the stigma, it grows down on the inside of the style stem like a very fine root. This fine thread keeps growing until it gets to the little seed box, or ovary, at the bottom. As soon as it reaches this ovary it sets free a tiny body, or cell, that unites with another body in the ovary. This is the beginning of the seed.

11. Sometimes bees may not come to the flowers so early in the spring. If no bees come and no pollen gets from the stamens over to the stigma on the top of the pistil, no seeds will grow. If the stigma is not so fortunate as to get any pollen from the bees, it will split into three parts, with one little knob on each part, and by bending over, it will reach down to where the pollen is dusted on the sides of

the flower. It sometimes gets the pollen in this way so that its seeds may grow.

12. Soon after the corm of the crocus begins to grow in the spring, other little corms start to grow on the top of the old corm. These little corms grow until they are as large as the old corm and are large enough for the gardener to plant the following spring.

13. If these corms are not replanted about every three years these little corms, by growing on the tops of the old corms, will at last be up to the surface of the ground and may be frozen during the cold weather.

14. The crocus is a beautiful plant to use as a border plant around a flower bed or to plant on the lawn. If it is planted on the lawn it will not hinder the mowing of the grass because it matures before the grass has grown long enough to cut.

15. The crocus is native chiefly to the Mediterranean region. The varieties usually cultivated are spring flowering plants. A few species flower in autumn.

## QUESTIONS

1. When should the crocus be planted?
2. What does the gardener plant when he wants to raise the crocus?
3. How does he plant the crocus?
4. What is the appearance of the crocus when it first comes up through the ground?
5. What colors are the petals and sepals?
6. What are the stamens and stigmas?
7. How does the pistil get the pollen from the anthers?
8. How do corms grow and why should the corm be transplanted about every three years?
9. Where does the seed begin to grow and what starts it to growing?
10. Where is the crocus generally planted?



DAFFODILS

## LESSON XVIII

## THE DAFFODIL

|          |        |           |
|----------|--------|-----------|
| stamen   | stigma | disturbed |
| anther   | bulbs  | freezing  |
| daffodil | crocus | royal     |

1. The daffodil is a royal flower. It wears a white collar and a yellow crown. This white collar is made up of six white sepals and looks like a beautiful white star with a yellow center.

2. This yellow crown is simply the outside opening of the flower tube. Inside of this tube is the pistil and, a little farther down, the stamens with their anther heads.

3. By looking carefully between these stamens, little holes or tubes will be seen. These little holes or tubes are for the butterflies. They push their long tongues down into these tubes and get the nectar which is down at the bottom of this nectar well.

4. The seed box of the daffodil is easily located by the swollen part of the stem. The seeds are very well arranged in this little house or seed box. This little house has three rooms in it. In each room are two rows of

seeds. These rooms are separated from each other by green walls.

5. Each knob of the stigma has a little fine tube which leads down to each of these rooms. When a grain of pollen gets on the knob of the stigma, it sends down through this tube a fine root, much the same as in the crocus, to one of these rooms. When this root reaches this little room the seed begins to grow. The daffodil grows from bulbs like the crocus and will come up every year, for years, if it is not disturbed, or killed by freezing.

6. The roots of the daffodil grow out from the underside of the bulb and sometimes grow to be a foot long.

7. Daffodils should be planted with more care than the crocus. The earth should be loosened to the depth of about one foot. The bulbs should then be planted about six inches deep and about one foot apart. This should be done about the first of October. After planting the bulbs, the ground where they are planted should be covered with four or five inches of stable manure.

8. The new bulbs grow on the side of the old bulbs and do not come up to the surface of the ground like the bulbs of the crocus.

## QUESTIONS

1. Describe the color of the daffodil.
2. Where may the pistil and the stamens of the daffodil be found?
3. How may the seed box, or ovary, be located?
4. How is the ovary arranged inside?
5. Where do the roots grow and how long are they?
6. Where do the new bulbs start to grow?
7. How and when should daffodils be planted?
8. Name two ways in which the daffodil differs from the crocus.



TULIPS

## LESSON XIX

## THE TULIP

|        |           |            |
|--------|-----------|------------|
| silken | grasp     | tulip      |
| sepals | onion     | cultivated |
| petals | coverings | ripening   |

1. No flower has more delicate colors nor more silken petals than the tulip. They grow in almost all colors. There are three petals and three sepals, the petals growing a little longer than the sepals.

2. The three sepals seem to think they should take care of their taller sisters inside. When the flower first comes above the surface of the ground, these three sepals are green and are clasped very closely around the petals. As the flower grows and lifts itself above the ground the sepals unfold their tight grasp and allow the beautiful petals to open out.

3. The sepals seem to admire their sister petals so much that very soon they begin to change from their green color to the same color of the petals. On stormy days the sepals never forget their duty and close around the petals to protect them.

4. Tulips, like daffodils, grow from bulbs. In the center of each bulb is the flower bud. Around this flower bud are fleshy coverings something like the layers of the onion. These fleshy coverings grow into leaves when the flower bud develops.

5. After the flower bud has developed and has matured, the sepals and petals drop off and the seeds in the ovary begin to grow rapidly. If these seeds are allowed to grow until they are ripe, the bulb, which has been forming under the ground, will not be strong enough to grow well the following spring. This is because the plant cannot furnish enough food for both the seeds, while they are ripening, and the bulb. If the seed stems are cut off after the petals and sepals fall, the plant will then send its food to the bulb, where it will be stored up for growth the following spring.

6. Tulip bulbs should be planted in October and great care should be taken to make certain that the place where they are planted is well drained. This may be done by digging a little trench away from the tulip bed. The water will then not cause the bulbs to rot dur-

ing the cold weather. If the ground is clay ground, it should be mixed well with sand before the tulips are planted.

7. The tulips should be planted about four inches apart in order that the tulip bed may show a solid color when in bloom. In order that the tulips may all bloom at the same time, care should be taken that the tulip bulbs all point upward when they are planted. If they do not, some of them may require a longer time to get through the ground.

8. After the flowers bloom and the seed-pods or stems are cut off, the bulb will begin to get ready for the following spring. A large bulb will develop in the center and small ones will grow around it. If the large center bulb is planted, it will bloom the first season. The small bulbs which grow around this center bulb will not produce blooms until the second year.

9. If the seeds are allowed to ripen and these seeds are planted, they will not produce blooms until about the fourth or fifth year. Seeds of cultivated plants cannot be depended on to produce flowers like the parent

flowers. This is why bulbs are planted and seeds are not planted.

### QUESTIONS

1. Describe the sepals and petals of the tulip.
2. What does the tulip do during a storm?
3. What kind of a bulb does the tulip have?
4. Why should the seeds of the tulip not be allowed to ripen?
5. Will these seeds grow and when will they produce flowers?
6. How do the new bulbs develop?
7. Will all of the new bulbs produce flowers the first season?
8. When and how should tulips be planted?
9. Why are not the tulip seeds planted?

## LESSON XX

## THE CHIMNEY SWIFT

sooty  
glued  
musical

darting  
balance  
pour

cousin  
spines  
suitable



CHIMNEY SWIFT

1. There are not many birds or animals that would care to make their home down on the inside of a sooty chimney. Before people lived in houses and before there were chimneys the swift lived in hollow trees and rocky caves. When chimneys came into use, it seemed to think they would make it a bet-

ter home than a hollow tree or the rocks. Why it thought so is difficult to answer.

2. The chimney swift is a cousin to the barn swallow and looks much like it. It has a very wide mouth and a short beak. It needs a wide mouth because it catches its food in the air as it flies. If it sees a fly in the air as it is flying by, it will dart after it in a very reckless manner. It is a wonder the chimney swift does not lose its balance and fall, it flies so swiftly and turns corners so sharply.

3. The swift can fly over a mile a minute,



BARN SWALLOW  
The cousin of the Chimney Swift  
Note difference in their tails

and while going at a rapid rate, without seeming to slow up, it will disappear down some tall chimney. The swift does not have as good a chance to make its home in chimneys now as it did years ago when people had large open chimneys and burned wood.

4. If the swift cannot find a suitable chimney, it will make its home in some old building. Here they will build their nest and raise their young.

5. The swift is dull brown in color, with gray wings. When it flies its tail and wings seem to end in sharp points.

6. The nest of the swift is made of small sticks or twigs that are glued together and stuck fast to the side of the wall with a sticky saliva from the bird's mouth. When the nest is finished it looks like a handful of twigs stuck to the side of the chimney.

7. The mother swift lays in this nest from three to five long and narrow white eggs. After the little swifts are hatched and are able to care for themselves, the swifts gather together in large numbers and live together in some large chimney.

8. The swift has sharp spines on the end of each tail feather. These spines and the sharp claws of their little feet make it easy for them to cling to the inside of the chimney. In this way the birds roost at night, using the tail feathers to prop them up. While they are roosting they look like they were hung up on nails to the side of the wall.

9. In the morning all of the swifts fly out of the chimney and around through the air all day, catching insects in their mouths as they fly. They seem to fly all day long and never seem to alight any place except on the inside of the chimney.

10. When they are coming out of the chimney there are so many of them that they look like smoke. After they come out they circle around and off through the air. In the evening they come back to their home in the chimney. They pour into the chimney like sand running into a hole. While the swifts are flying around through the air and while they are flitting around in the chimney, they are twittering a soft musical song.

## QUESTIONS

1. Where did the swift live before there were chimneys?
2. What kind of a mouth and beak has the swift?
3. What does the swift eat and where does it get it?
4. What is the color and size of the swift?
5. How fast can the swift fly?
6. How and where does the swift build its nest?
7. How many eggs does the swift lay and what is their color and shape?
8. After the little baby swifts are grown and able to care for themselves, how do the swifts live?
9. What kind of a song do they sing?
10. How do swifts roost?



## WHITE OAK

- |                        |          |                      |
|------------------------|----------|----------------------|
| 1. Winter twig         | 3. Acorn | 5. Staminate flower  |
| 2. Flowering branchlet | 4. Leaf  | 6. Pistillate flower |

See page 128 for description

## LESSON XXI

## THE OAK TREE

|        |         |           |
|--------|---------|-----------|
| Druids | tanning | medicine  |
| galls  | thimble | lumber    |
| timber | logs    | chemicals |

1. The oak tree is a tree which is very important in history. It was a special tree of the Greeks. The King Oak of Windsor Forest was very important during the time of William, the Conqueror of England. The Druids, who were a people during the early history of England, had a strange religion which centered around the oak tree. The Charter Oak of the United States history has its interesting story.

2. It is easy to know the oak tree from other trees by its leaves, bark, and its fruit. The fruit, called acorns, readily distinguishes the tree. The oak tree does not reach maturity until it is from sixty to one hundred years old, and grows about sixty feet high. Its branches are rough and strong and reach almost straight out from the trunk of the tree.

3. The flowers of the oak develop into the

acorn. These acorns are shaped much like a thimble and grow in little saucers. In some of the states these acorns are so plentiful that they are used to fatten hogs for market.

4. The oak tree has a long life. It sometimes lives to be one thousand years old. It does not produce acorns until it is about twenty years old. There are many kinds of oak trees, but the white oak and the live oak are the most valuable.

5. The wood of the oak tree is very hard and is used to make many things, such as furniture, wagons, ships, and anything that requires wood that is strong and that will not decay quickly.

6. The bark of the oak tree is used in making medicine and in tanning the hides of animals. The inside of the bark is sometimes used to make a kind of cloth.

7. When the wood has not been cut out of the tree and the tree is still growing in the forest, it is called timber. After it is cut down and taken to a mill and sawed into boards, it is called lumber. The tree trunk, when it is cut into pieces, is called logs.

8. While the trees are being cut up into boards a great deal of dust is made by the saw as it cuts through the log. This dust is called sawdust and is used in making dyes and chemicals.

9. The oak tree will grow almost any place in temperate zones on all continents, but is



GARRY OAK—POST OAK—OREGON OAK

1. Leaf

2. Acorn

3. Winter twig

See page 128 for description

chiefly found in North America. It sends its roots far down into the ground for water, and, being very long, they hold the tree firmly against the storms of winter. Some oaks grow on flats and in the bottom lands, as the Post Oak. Most oaks do not grow well on wet ground.

10. In the fall the leaves turn many beautiful colors. The leaves of the white oak turn to a dark red, the leaves of the black oak to a dirty yellow, the leaves of the chestnut oak to a yellow, and the leaves of the scarlet oak to a brilliant red.

11. Oak galls or oak apples sometimes appear on the leaves of the oak tree. There are more than a thousand kinds of insects that injure trees. Some of these insects bite the leaves of the oak tree and leave some poison in the leaf and also some of their eggs. The oak gall or oak apple is a growth which begins at once to grow around this bite. This covers the poison and the eggs. These eggs hatch in this oak gall and the gall-fly which comes out of the egg eats its way out of the oak gall.

12. These oak galls are difficult to find until in the fall because they are the same

color as the leaves. These galls are used to make ink, and material for dyeing.

## QUESTIONS

1. Name three things which are made from the oak tree.
2. What is the story of the Charter Oak?
3. What are acorns?
4. What are oak galls?
5. Of what use are acorns?
6. How high does the oak tree grow and how long may it live?
7. Name four things which are made from oak lumber.
8. What is the difference between timber and lumber?
9. What is sawdust and for what is it used?
10. Of what value is the bark of the oak tree?
11. To what colors do the leaves of the oak turn in the fall?
12. What causes oak galls?
13. Where will oak trees grow best?
14. Name two important kinds of oak trees.

LESSON XXI—*Continued.*

## OAK TREES—IDENTIFICATION AND USE

"The oak tree was an acorn once, and fell upon the earth;  
And sun and shower nourished it and gave the oak tree birth;  
For centuries grows the oak tree, nor does its verdure fail;  
Its heart is like the iron wood, its bark like plaited mail."

WHITE OAK—Found in Ontario. Occasionally in Quebec and the maritime provinces of Canada. Southern Maine, southward to Florida, westward to Texas, Kansas, and Minnesota. See page 122.

*Habit*—Trunk usually massive with horizontal limbs; gnarled and twisted in old age. It reaches its greatest size in the Ohio valley. Bright green leaves, dull or glossy, 5 to 9 inches long and 3 to 4 inches wide, turning a deep red in the autumn before falling. Acorns  $\frac{3}{4}$  inch long, and sweeter than the acorns of other oaks.

*Use*—For fuel, coarse lumber, fence posts, ship building, agricultural implements, cabinet making, and interior finish.

GARRY OAK—PACIFIC POST OAK—Found from the valley of the Fraser River, and Van-

couver Island, southward to central California. See page 125.

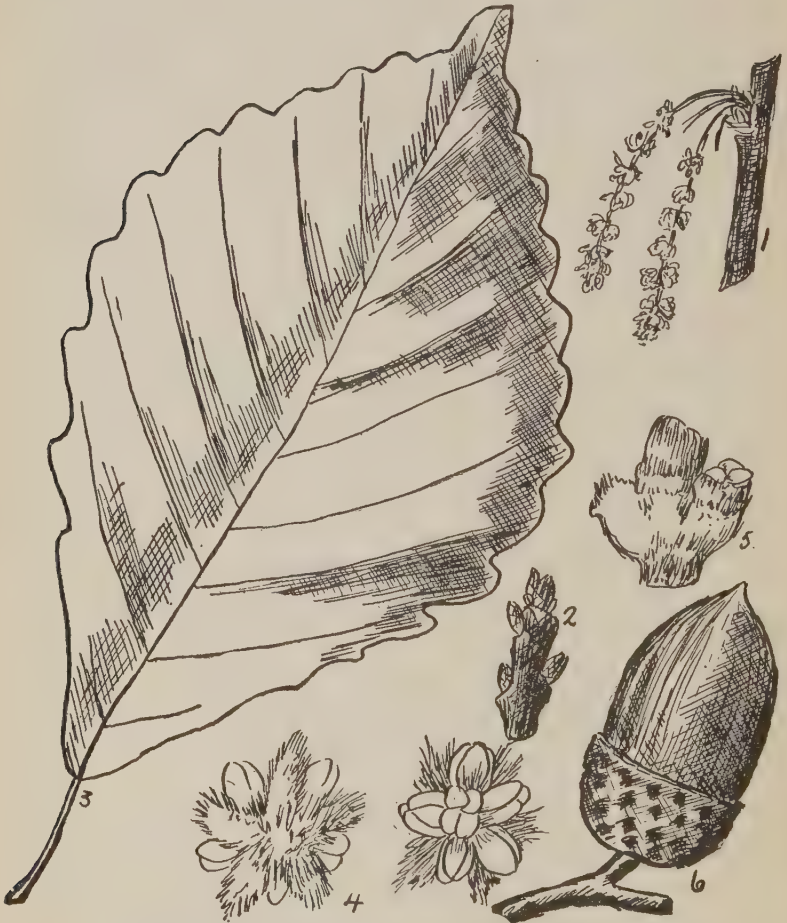
*Habit*—Trees 60 to 100 feet high, stout, erect, or spreading branches. On the mountain sides it is shrubby in growth. In the rich valleys it is a lofty tree. It resembles the post oak of the east. Leaves dark green, leathery, 4 to 6 inches long, often turning scarlet in the autumn before falling.

*Use*—For construction of ships, vehicles, agricultural implements, and cabinet work. It is considered the most important timber oak on the Pacific coast. It is named after Nicholas Garry, in recognition of his aid to scientists in the northwest.

**ROCK CHESTNUT OAK**—Found from Maine westward to Ontario. Southward to New Jersey, Virginia, and in the mountains of Tennessee, Georgia, and Alabama. See page 130.

*Habit*—Trunk is divided rather low down into several principal branches; when not crowded the tree is sometimes broader than it is high. Leaves dark yellowish-green and shining, thick and almost leathery, turning brown in the autumn before falling.

*Use*—For fuel, fencing, and railway ties.  
The bark is used in tanning.



ROCK CHESTNUT OAK LEAF, FLOWER, AND ACORN

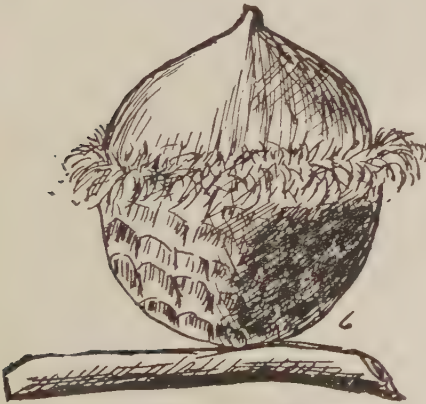
- |                        |                      |
|------------------------|----------------------|
| 1. Flowering branchlet | 4. Staminate flower  |
| 2. Winter twig         | 5. Pistillate flower |
| 3. Leaf                | 6. Acorn             |

See page 129 for description

**BUR OAK**—Found from Nova Scotia to Manitoba, and from the foothills of the Rocky Mountains to Texas, Tennessee, and the Atlantic coast. See page 132.

*Habit*—Trees 40 to 60 feet high and 1 to 3 feet in diameter. Average height 80 feet. In some places it reaches a height of 160 feet, and in some places it is a shrub. Leaves yellowish-green, 4 to 6 inches long. Yields

acorns annually,  $\frac{3}{4}$  to 2 inches long, in cups  $\frac{3}{4}$  to 2 inches wide, enclosing from  $\frac{1}{3}$  to nearly the entire acorn. A fringe-like border around the rim of the cup.



BUR OAK ACORN

*Use*—For all purposes for which the white oak is used. All kinds of construction work and cabinet work.

**RED OAK**—Found from Nova Scotia westward to Lake Superior, southward to Kansas and Florida. See page 134.

*Habit*—Trees 50 to 85 feet high, 2 to 6



# BUR OAK LEAF AND FLOWER

1. Winter twig

2. Leaf

3. Flowering branchlet

4. Staminate flower

5. Pistillate flower

See page 131 for description

feet in diameter above the swell of the roots. It reaches its greatest development in the region between the Great Lakes and the Ohio River. A large forest tree. Acorns maturing the autumn of the second year. A fine tree for street or landscape planting. Leaves bright green, 4 to 8 inches long, 3 to 5 inches wide, turning a purplish-red in the autumn.

*Use*—For construction work, general carpentry, and furniture. The bark is used in tanning.

**LIVE OAK**—Found in the southern states from Virginia southward to Florida, westward to Mexico and Lower California.

*Habit*—Trunk thick with horizontal limbs of great length forming a low, spreading dome, like an apple tree. Often shrubby. 50 to 75 feet high. Evergreen; the small leaves remain on the twigs all winter. Long, gray moss hangs from tree as a drapery.

*Use*—As an avenue and shade tree.



# RED OAK LEAF, FLOWER, AND ACORN

1. Flowering branchlet
2. Leaf
3. Winter twig
4. Staminate flower
5. Pistillate flower
6. Acorn

See page 131 for description

A VERY PRACTICAL WAY OF NAMING AND DISTINGUISHING TREES, AS GIVEN BY GIFFORD PINCHOT, IS AS FOLLOWS:

1. Young trees which have not reached a height of three feet are seedlings. They are called seedlings in spite of the fact that any tree, of whatever age, if it grew from a seed, is called a seedling tree.

2. Trees from 1 to 10 feet in height are small saplings.

3. Trees from 10 feet in height until they reach a diameter of 4 inches are called large saplings.

4. Trees with a diameter ranging from 4 to 8 inches are called small poles.

5. When the diameter is from 8 to 12 inches, the trees are called large poles.

6. Trees which have a diameter ranging from 1 to 2 feet are called standards.

7. All trees over 2 feet in diameter are known as veterans.

It is important to remember that all these diameters are measured breast high, or at the height of a man's chest, about 4 feet from the ground. In forestry, roughly speaking, this is the general custom.

## OUTLINE FOR STUDY OF OAK TREES

1. Kinds. Where found.
2. How distinguished from other trees.
  - (a) Branches (extend straight out from the tree).
  - (b) Leaves (various indentations).
  - (c) Fruit (kind of acorns and use).
3. Age. Disease.
4. How determined.
5. The oaks in history.
6. Describe an oak you have seen, giving details as to when and where you saw it; how you recognized it as an oak; the kind of oak, and any other facts you observed.

## QUESTIONS.

1. Compare and contrast the white oak and the bur oak.
2. Why was the Garry oak so named?
3. Compare the leaves of the Garry oak and the rock chestnut oak.
4. For what is the rock chestnut oak used?
5. Compare and contrast the live oak and the Garry oak.
6. What is said of the habit of the red oak?
7. What practical way of naming and distinguishing trees is given by Gifford Pinchot?

## LESSON XXII

## THE THISTLE

|            |            |            |
|------------|------------|------------|
| selfishly  | appearance | fertilized |
| scattering | dignified  | protection |
| difficult  | particular | multiplies |

1. The thistle is a plant that has very few human friends. It is disliked by both the farmer and the gardener. It never finds a welcome in either the flower garden or on the lawn.

2. One reason that it is so disliked is because it acts so selfishly. If it is given any chance at all to grow it will attempt to crowd out all other plants. It does this by sending up new plants from its roots and also by scattering its seed widely.

3. The most disliked of all thistles is the Canada thistle. This particular kind spreads more rapidly than others and is much more difficult to kill.

4. In appearance the thistle is very proud and dignified. It points its swords in all directions as though it were daring anyone to attack it.

5. The bull thistle is probably the largest variety of thistle and will sometimes grow to the height of several feet and produce large beautiful purple blossoms that are very fragrant.

6. In very young plants the under side of the leaves is covered with a flannel-like coat. This serves as a protection for the baby plants.



THISTLE AND BUTTERFLY

7. The thistle uses great care that its pistils are not fertilized by its own pollen. It keeps its pistils securely closed until they have grown out past its own stamens. They can then receive the pollen carried by bees and butterflies from other plants.

8. Not many flowers are visited by more bees and insects than the thistle. Bees, insects, and even moths, are glad to visit the thistle blossoms to get the nectar.

9. When the seeds have developed and are ready to be distributed, little parachutes are found attached to each seed. The seeds are now hard shelled and pointed. When they become loosened from the plant they are sometimes carried for a great distance by the wind. If no wind is blowing they may fall seed downward near the parent plant. If they can come into contact with the soil they will grow into another thistle.

10. Some thistles do not produce seed until the second year. After the seed is produced the plant dies. This is, however, not true of the Canada thistle which grows and multiplies not only by means of its seeds but also from its roots. Some seed pods may have as many as one hundred seeds.

## QUESTIONS

1. Why does not the thistle have many human friends?
2. Why is the Canada thistle most disliked?
3. In what way does the bull thistle differ from the Canada thistle? What is its height and what is the color of its blossom?
4. How does the thistle protect itself?
5. How do the pistils keep from being fertilized by their own stamens?
6. What insects visit the thistle?
7. Explain how the seeds are distributed.
8. How long does it require some thistles to produce seed?

## LESSON XXIII

## THE MILKWEED

|         |          |          |
|---------|----------|----------|
| wrapped | injury   | dwarfed  |
| flannel | bleeding | wound    |
| juice   | rubber   | material |

1. The milkweed, when it is a mere baby, is wrapped in very soft clothes. These clothes are very much like the warm flannel clothes that all little babies wear. When it first comes out of the ground its first suit looks just like flannel.

2. It keeps its clothes folded around its stalk, or stem, until it is well out of the ground. It seems to be trying to keep warm. After the sun shines on the leaves and they get warm they will open out. The flannel side of the leaves is then on the underside.

3. The milkweed is well prepared for any injury that may come to it. If its leaves or stalk are cut it will at once send out of the wound a milky juice. The purpose of this juice is to heal the wound quickly so that the injury will not kill the plant.

4. This juice is very sticky and when it



MILKWEED LEAVES AND PODS

comes to the air it hardens and keeps the wound from bleeding. It is something like glue but it is white in color and very soon becomes like rubber.

5. If apple trees or shade trees are pruned very much in the spring when the sap begins to flow, they will bleed a great deal and the tree may die or be dwarfed. These trees do not have a sticky material to send out of their wounds, like the milkweed, to heal their wounds. If they did they might not be injured by the pruning.

6. This white sticky material is not sap, but is used only for protecting the plant from injury. In addition to healing the wounds, it is so bitter that animals will not eat the milkweed because of this bitter taste. This often keeps the plant from being destroyed.

7. The leaves of the milkweed are arranged in pairs as if to keep each other company. They so arrange themselves that they will not shut off the sunlight from their brothers below them on the stem or stalk.

8. The flower is very difficult to study because it is composed of many parts and is very different from most flowers. If we

look carefully into the flower we will see five little bags of nectar. This nectar is the gift which the plant gives to the bees for distributing their pollen and fertilizing their flowers.

9. After the milkweed has become full grown it develops green pods in which the seeds are found. These seeds are closely nestled together in a warm silky nest.

10. As soon as the pod is opened the air begins to dry the silk. Very soon a beautiful balloon is made out of this silk, which is able to carry the seed far away. A very gentle wind will sometimes carry the seed as far as a mile.

11. When the seed finally comes to the ground it is ready to grow into another milkweed just like its parents.

#### QUESTIONS

1. What is the appearance of the milkweed when it first comes out of the ground?

2. What causes the leaves of the baby milkweed to open out?

3. What kind of material is the white juice which comes out of the milkweed when the leaf or stalk is cut?

4. What is the purpose of this white juice?
5. Does this white juice help the plant in more than one way?
6. How are the leaves of the milkweed arranged? Why?
7. Describe the way the flowers of the milkweed attract bees and insects.
8. How does the milkweed distribute its seeds?

## LESSON XIV

### PICTURES

|              |           |             |
|--------------|-----------|-------------|
| culture      | household | modern      |
| improvements | furnish   | appropriate |
| judgment     | adapt     | manager     |

1. The culture of a home may easily be determined by the pictures found on its walls.

2. If a home were simply a place where one might keep warm and be protected from the snow, rain, and enemies who might harm, then pictures would not be necessary. The homes of savages and the dens of wild animals have no pictures on their walls.

3. Homes have become places of beauty and happiness, as well as places of protec-

tion. Anything that will add to or increase this happiness should have a place in the home.

4. We place furnaces in our homes in order that we may be comfortable during the winter when the weather is cold. Many other modern improvements such as electric washers, electric sweepers, electric lights, toilet rooms, telephones, gas stoves and many other things of a like nature are now used in our homes so that we may have more comfort, pleasure and happiness.

5. Pictures have always been a great source of happiness and pleasure. When properly selected and properly arranged in the different rooms of the house, they are well adapted for beautifying the home and for bringing pleasure to those who see them.

6. The different parts or rooms of the house are used for different purposes. There should be rooms where the members of the family sleep, a room or rooms where the members of the family read and study, a room where they live and entertain their friends, a room where they eat, and a room where the food is prepared. Each of these parts or rooms of the

home should be built and furnished so that the purpose of this part may be carried out with as much comfort and happiness as possible to the members of the household.

7. Pictures which serve a very wise purpose in the sleeping rooms may not serve a wise purpose in the living room. A picture which may be well adapted for a library or study room and may suggest beautiful thoughts of art, history, or literature may be entirely out of place in the dining room or kitchen. Each picture must serve a wise purpose and must be appropriate to the room or place in which it is found.

8. Pictures which suggest hospitality, security, protection, and prayer are well adapted for sleeping rooms. Those that suggest joy, pleasure and health are well adapted for the dining room. For the study room or library there should be selected pictures of art and copies of the best of the great masters of painting and literature. Family pictures or photographs should not be placed in rooms where we entertain our friends or where visitors will see them. These pictures may interest the members of the home but

they will not afford pleasure to others. In the minds of people who are not acquainted with our relatives these pictures produce a feeling which has no pleasure in it and generally produces a feeling of sadness. This feeling of sadness is often produced in the minds of the members of the household when such pictures are placed in prominent places.

#### QUESTIONS

1. What is the purpose of pictures in the home?
2. Name the different rooms in the ordinary home.
3. What was the original purpose of the home?
4. What change has been brought about in the purpose of the home?
5. Has the home ceased to be a place of protection?
6. Name the kind of pictures which should be placed in the different rooms of the modern home.
7. Should the people of the home know the story of the pictures placed in the different rooms if the picture suggests a story?

8. Name two pictures which represent a story.

9. Why should family pictures not be placed in reception rooms?

## LESSON XV

### THE HOME BEAUTIFUL

|              |            |            |
|--------------|------------|------------|
| architecture | unsightly  | appreciate |
| landscape    | council    | humble     |
| variety      | nurseryman | catalog    |

1. It has not been many years since very few people painted their houses. These houses were generally built of logs and could not easily have been painted even if their owners had desired to do so. In modern days all houses are painted to protect the wood out of which they are built and to beautify the appearance of the house. The home must not only be a place of shelter but it must be a place of happiness and it must be beautiful. Anything that adds to the beauty of the home will also add to the happiness of its members.

2. Not only are people making their houses beautiful but they are making the sur-

roundings of the home attractive. Unsightly billboards are not permitted in certain parts of some of our cities for the reason that people do not want them near their homes. These billboards always injure the appearance of all places where they are constructed and these places might, otherwise, be made very beautiful and attractive.

3. Whether or not the grounds which surround our homes are to be made beautiful will not depend so much upon the amount of ground or the amount of money we have as upon the time and effort that is used. No home which has even a porch need be without vines and flowers. Window boxes, used either inside or outside of the house, will add much to the attractiveness of even the most humble home. These boxes may be made of wood and made to fit the window or porch railing in which they are to be placed. Care should be taken to bore holes in the bottom of the flower boxes so that when the flowers are watered the excess water may drain off. Under these boxes should be placed small strips of wood so that the box will not fit too closely to the railing or window.

4. The kind of flowers to plant in these window boxes will differ as much as the tastes and desires of people differ. There are a few rules, however, which may well be followed. Plant flowers which bloom frequently and which do not die "in a day." Plant a variety of flowers so that some may be in bloom at all times. Any good flower catalog or nurseryman will furnish all of the information necessary as to kinds and varieties for planting, either in boxes or for open planting on the lawn. For boxes, care should be used that no variety is selected that will grow too tall for the others that are planted in the same box.

5. Landscape gardeners spend all of their time planning to make some yard, lawn, or city more beautiful. Railroad companies employ men for the purpose of keeping their grounds along the railroad, and particularly around the stations, beautiful. They must first see to it that the grounds are well graded if the ground happens to be rough or uneven. After the ground has been made smooth by raking and rolling and a sufficient amount of good grass seed is sown, their next care is to

keep this grass mown and the weeds removed. If the grass is kept mown, the weeds, in many cases, die out and will give little trouble.

6. In addition to keeping the lawn neat and beautiful by keeping the grass mown, these gardeners keep flower beds in bloom during most of the summer. All of this work is done in order that the people who travel on their trains may get more pleasure from their journey.

7. People should do for their home grounds just what these gardeners do for the grounds along the railroad. This effort may result in nothing more than a window box but some effort should be made to make the place where we spend much of our time as beautiful and attractive as possible.

8. If the grounds are small and well shaded from the sunlight, neither flowers nor grass will grow well. There are some kinds of flowers and grass which require very little sunlight. Care should be taken to select these kinds from catalogs if the sunlight is limited.

9. If the grounds are exposed to sunlight, any effort which may be made to make these grounds beautiful will be well repaid by the

pleasure and happiness of those who appreciate green grass and beautiful flowers.

10. Cities, as well as railroads and individual owners, have come to appreciate the value of beauty. Every progressive town or city has its landscape committee whose business it is to make the city beautiful. Their work includes the removal of unsightly objects from the sight of their citizens. This may mean the removal of an advertisement painted on the side of a building and exposed to the sight of every passer-by, the removal of a billboard, or the planting of vines on an embankment where grass will not grow easily. Besides removing these unsightly objects, their work also includes making the parks, and public grounds beautiful with trees, flowers and grass. In some of the smaller towns the authorities of the towns offer annually a prize or a reward for the best kept lawn or grounds. All of this effort is made that the citizens may have beauty around them. The authorities also know that when people have beauty around them they will be better people and better citizens.

11. Owners of factories know that by keep-

ing their grounds and buildings beautiful their employees will be happier and when they are happy they will do more and better work.

12. This effect of happiness and contentment is produced in the case of private homes just as much as in the case of railroads, cities, and factories. It is not the amount of money expended on shrubbery and flowers that makes the home attractive and beautiful so much as it is the arrangement and care these plants receive. Good taste is shown by the kind, arrangement, and care of these flowers just as much as good taste is shown by the pictures which we find on the walls of the rooms of the home.

13. Many things may be done without much cost which will add much to the beauty of our home surroundings. Unsightly fences may be removed or covered with beautiful vines. Vines may also be used to cover rough stones or walls that have no beauty. Porches or buildings that have no beauty of form or color may be largely concealed or made beautiful and artistic by the planting of shrubbery around them or near them.

14. The arrangement of flower beds will depend on the size, shape, and slope of the lawn and also on the individual taste of the owner.

#### QUESTIONS

1. What is the purpose of painting houses?
2. Name some of the unsightly things which may be found around the home or around our cities.
3. How are window boxes constructed and what kind of flowers should be planted in them?
4. What are landscape gardeners?
5. Why do railroads and factories have beautiful grounds where it is possible?
6. What care should be taken in planting flowers and grass in shady places?
7. Name some of the things which cities do to help make their cities beautiful.
8. Name some things which may be done for beauty around the home without cost.

## LESSON XVI

## THE PROPAGATION OF PLANTS

|           |         |           |
|-----------|---------|-----------|
| propagate | cambium | cion      |
| beveled   | budding | sap       |
| graft     | spores  | narcissus |
| vigorous  | resin   | dahlias   |

1. All plants do not grow from seed. Some grow from spores, some from bulbs, some from cuttings, and some are produced by processes called budding and grafting.

## CUTTING

2. Plants, like the grapevine, or trees, like the poplar, may be propagated by cutting.



Propagating a plant by layering

The time when this process is most successful is just before winter begins. At this time of the year the sap is not very active in the stem and the plant is preparing itself for the cold winter months that are ahead.

3. A cutting about eight inches long of the last season's growth should be taken from the plant or tree that is to be propagated, or a branch turned down, care being taken that there are one or more buds on this branch. It should be placed in the ground to a depth of from one to two inches and the soil carefully firmed down over it. Here it should remain until the following spring. When warm weather returns, the cutting should be transplanted with at least one bud above the surface of the ground.

4. If care is used in the selection and planting of this cutting, a vigorous growth may be expected. Liquid stable manure should be applied freely during the first two years of growth and all weeds and grass should be kept away from the plant to a distance of from eight to twelve inches.

#### BULBS

5. Some plants, when they become mature, develop a bulb near the root, such as the narcissus and the tulip. Each plant will develop quite a number of bulbs. When the plant dies down to the surface of the ground in the autumn, it has only disappeared for

the winter. A sufficient amount of nourishment has been stored up in these bulbs to start a new growth as soon as the weather becomes warm in the spring. These bulbs will feed the new plant when it begins to grow until the roots are able to furnish food.

6. In many sections of the country, the winters are so cold that these bulbs will freeze unless they are protected by a heavy covering or are taken from the ground and placed in a dry cellar where they will not freeze.

7. The bulbs of the Chinese lily may be placed in a glass bowl containing water and sufficient stones to support the bulbs. In this way the development of the bulbs into roots and plants may easily be observed.

#### TUBERS

8. Tubers, which resemble bulbs in many ways, are in reality only enlarged parts of the stem growing underground. In these tubers the nourishment is stored up for future use just as it is in the bulbs. Potatoes and dahlias are good examples of tubers.

#### GRAFTING

9. There are various methods of grafting. It often occurs that a plant may have a very



APPROACH GRAFTING

This process is used by gardeners. Corresponding slices of bark are cut from two branches, the two equal parts are placed together, and lashed firmly with a cord, which is again covered with earth to keep the wound moist until a junction has taken place.

vigorous stem and the flower or fruit be very small or imperfect. Some apple trees produce small apples of an unpleasant flavor and the trunk and foliage may be strong and vigorous.

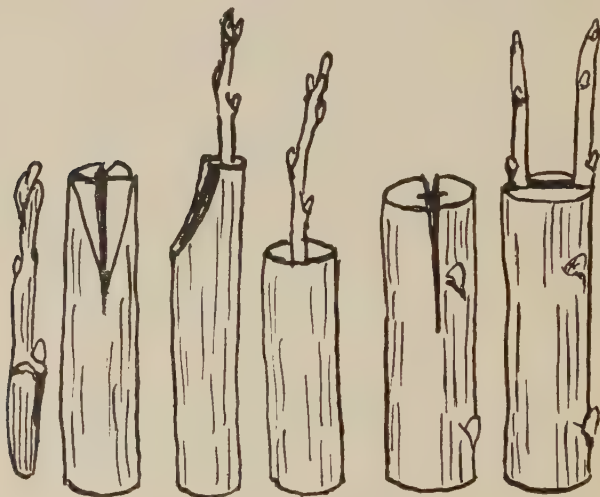
Some rose bushes may produce large and vigorous canes or vines and yet the flowers may be small and imperfect.

10. Gardeners have learned to make use of this vigor of the plant and to cause it to produce fruit or flowers of large size and of excellent quality. The process by which this is done is called grafting. To do this successfully is not a difficult task if care is taken.

11. Before attempting to do this work a wax should be prepared by melting in a vessel tallow, resin, and bees-wax in the propor-

tion of fifteen percent tallow, sixty percent resin, and twenty-five percent bees-wax.

12. Great care should be taken in the selection of the cion which is to be grafted and the stem to which the cion is to be joined. A vigorous cion of the last year's growth should be used, the size of which is the same as that of the stem to which it is to be grafted.



CLEFT GRAFTING

13. The stalk, or stem, and the cion should both be small and of the same diameter. Both should be cut off in a slanting direction. If the cion is long it should be cut down to about eight inches. The slanting end should

then be split to a depth of a little more than the diameter of the stalk. This slanting surface should be about twice as long as the stalk is thick and the split should be made in the center of the surfaces of both the cion and the stalk. These split ends should then be forced together just as the teeth of a comb may be fitted into the teeth of another comb.

14. Great care should be taken that the cambium layer of the cion comes in contact with the cambium layer of the stalk. This cambium layer is the slippery part which we find just underneath the bark and is the part of the stem which produces the growth.

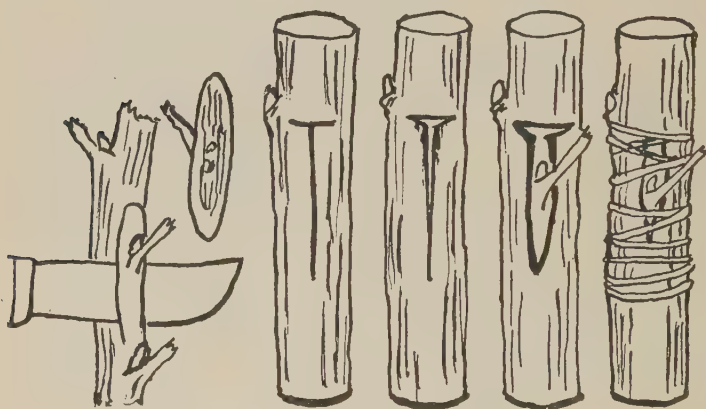
15. When the cion and the stalk are well fitted together, the wound should be thoroughly wrapped with strips of muslin about one quarter of an inch wide which have been well saturated by dipping into the prepared wax. The wound should not be wrapped while the wax is hot. This process of grafting should be done before the sap begins to flow freely.

16. It is not possible to graft a cion of any plant on a stalk of any other plant. The cion and the stalk must belong to plants of the

same family. The peach will unite with the plum and the quince with the pear, but the apple will not unite with the peach.

#### BUDDING

17. Propagation by budding is performed during the growing season and usually on trees from one to five years old. It is difficult to carry out successfully the process of grafting on stone fruits such as the cherry, peach, or plum. The process of budding is generally used to propagate such fruits.



PROPAGATION BY BUDDING

18. A strong vigorous twig, on which are some buds, may be selected from a peach tree to be grafted on a plum tree. The bark on the plum tree should be cut cross-wise to the

depth of the cambium layer, this cut being from one to two inches long. Through the middle of this cut another cut should be made downward. This cut should be from two to three inches long. The two cuts will then form a T shaped wound, the two corners of which may be pulled back for the insertion of the twig to be taken from the peach tree.

19. The twig may now be taken from the peach tree by cutting away with it a small piece of the bark out of which it is growing. The bark end of this twig should be inserted in the T shaped wound and the square corners pressed down firmly over the bark end of the twig. The cambium layer of the plum tree will then come in contact with the cambium layer of the peach twig. A cord should be wrapped around the wound to hold the twig firmly in place.

20. This process of budding should be carried out in the summer rather than in the spring. If it is done in the spring the loss of sap may do injury to the tree.

#### SPORES

21. Many plants which are propagated by spores have a bad reputation among most peo-

ple. The mold that we find on bread and old clothes, the rust that we find on wheat, the smut on corn, the blight on apples, the toadstool, and the mushroom, are all plants that are propagated by spores. All of these seem to be robbers because they cannot produce their own food and must get it from other living plants. If they do not secure it from a plant that is living, they must get it from products of plants.

22. These spores are very small seeds, so small that they may easily be carried in the air. To discover them easily, a strong glass must be used. However, some spores may be seen without a glass. Spores are also carried on seeds and insects. It is because these spores are so easily carried that such diseases as the wheat rust, potato scab, and corn smut may easily be carried over an entire country within a very short time.

23. If a piece of cheese is exposed to the air, these spores will find it and begin to grow on its surface. This growth often produces an offensive odor, caused by the decomposition of the protein in the cheese. If a strong glass is used, these plants may be studied with

much interest. When the growth of these spores does damage to some other living plant as it does in the corn smut or the potato scab, it is called a disease.

24. These spores differ much in character. Some kinds attack corn, and grow into corn smut. Others may find their way to pieces of dead wood and develop into toadstools, while others develop best on old bread, cheese, or sour milk.

25. These spores that attack living plants do much damage to growing vegetation because they must get some of the food which the other plant has produced for itself. Millions of dollars worth of plant life are destroyed each year because of these spores. Another kind of spore is produced by ferns and mosses. These do not live by feeding on other plants because they have green colored material of their own and with this green material they can produce their own food.

#### QUESTIONS

1. From what do plants grow?
2. What kind of plants and trees are propagated by cutting?

3. Explain the process of propagating plants and trees by cutting.

4. What care should be taken to insure a vigorous growth?

5. Name some plants that develop bulbs.

6. What are tubers?

7. What preparation should be made for successful grafting?

8. Explain the process of grafting.

9. What is budding? With what fruits is the process of budding used?

10. Explain the process of budding. When should it be done?

11. Discuss the different kinds of spores. What plants are propagated by spores?

12. What can you say of the damage done to growing vegetation by spores?

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